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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
SITE SAFETY PLAN

Date: February 16, 1995

Project Name: Sauget Landfill
St. Clair County
Sauget, Illinois

ERCS Delivery Order #: 5001-05-365

TAT Technical Direction Document #: _____

U.S. EPA Site I.D.#: _____

ERCS Job #: 8165

Adopted By: _____ Date: 2-21-95
ERCS Response Manager

Adopted By: _____ Date: _____
E & E Lead TAT Member

Adopted By: _____ Date: 2/21/95
U.S. EPA On-Scene Coordinator

Adopted By: _____ Date: 2/18/95
ERCS Safety Manager

Adopted By: _____ Date: _____
E & E Safety Officer

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

MANDATORY ATTACHMENTS

- ATTACHMENT A SITE SAFETY PLAN AMENDMENTS
- ATTACHMENT B SITE MAPS
- ATTACHMENT C CHEMICAL HAZARD INFORMATION
- ATTACHMENT D PERSONAL PROTECTION EQUIPMENT AND RESPIRATORY PROTECTION SOP'S
- ATTACHMENT E DRUG AND ALCOHOL PROCEDURES
- ATTACHMENT F ACCIDENT REPORTING/INVESTIGATION
- ATTACHMENT Z SITE SAFETY PLAN ACKNOWLEDGMENT FORM

OPTIONAL ATTACHMENTS

HAZARDS AND SOPS ASSOCIATED WITH:

___ OSHA Guidance and Regulations

___ Confined Space

___ Drum Handling

___ Drum Sampling

___ Opening Drums and Overpacks

___ Drum Staging and Overpacking

___ Drum Excavation

___ Empty Drum Crushing

___ Drill Rig

G Site Walkthroughs/Entry

___ Housekeeping and Material Storage

___ Hazardous Waste Storage

___ Demolition

H Working Around Heavy Equipment

H General Heavy Equipment Operations

_I_ Excavation

_J_ Truck Loading

_K_ Soil Sampling

___ Liquid Sampling

___ Compatibility Testing and Compositing of Samples

___ Lab Packing and Lab Inventory

___ Flammable/Combustible Liquid Transfer

___ Corrosive Liquid Transfer

___ Use of High Pressure Water Cleanup

___ Use of a High Pressure Water Cleaner in Vats

___ Compressed Gas Cylinders

___ Heat Stress

_L_ Cold Stress

___ Electrical Safety

___ Traffic Control

___ Fire Prevention and Protection

___ Work from Elevated Surfaces

___ Cranes

___ Rigging

___ Lockout/Tagout

___ Welding/Cutting/Grinding

___ Other: _____

_____

_____

GLOSSARY OF ACRONYMS

ANSI	- AMERICAN NATIONAL STANDARDS INSTITUTE
APR	- AIR PURIFYING RESPIRATOR
ACGIH	- AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
CFR	- CODE OF FEDERAL REGULATIONS
CGI	- COMBUSTIBLE GAS INDICATOR
CLEAN ZONE	- SUPPORT ZONE
CSEP	- CONFINED SPACE ENTRY PERMIT
DECON	- DECONTAMINATION
ERCS	- EMERGENCY RESPONSE CLEAN-UP SERVICES
HNU-PID	- HNU PHOTOIONIZATION DETECTOR
HOT ZONE	- EXCLUSION ZONE
IAW	- IN ACCORDANCE WITH
IDLH	- IMMEDIATELY DANGEROUS TO LIFE & HEALTH
MREM/hr	- MILLI-ROENTGENS EQUIVALENT IN MAN PER HOUR
NIOSH	- NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH
OSC	- ON-SCENE COORDINATOR
OSHA	- OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION LIMIT
OVA	- ORGANIC VAPOR ANALYZER
PAPR	- POWERED AIR PURIFYING RESPIRATORS
PEL	- PERMISSIBLE EXPOSURE LIMIT
PPM	- PARTS PER MILLION
RES	- RIEDEL ENVIRONMENTAL SERVICES, INC.
RM	- RESPONSE MANAGER
SCBA	- SELF-CONTAINED BREATHING APPARATUS
SOP	- STANDARD OPERATING PROCEDURE
SPCC	- SPILL PREVENTION CONTROLS & COUNTERMEASURES
TAT	- TECHNICAL ASSISTANCE TEAM
TLV	- THRESHOLD LIMIT VALUE
TWA	- TIME WEIGHTED AVERAGE
U.S. EPA	- U.S. ENVIRONMENTAL PROTECTION AGENCY

INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed for the Sauget Landfill site, to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes. The procedures and guidelines contained herein were based upon the best available information at the time of the plan's preparation. Specific requirements will be revised when new information is received or conditions change. A written amendment will document all changes made to the plan. Any amendments to this plan will be included in Attachment A. Where appropriate, specific OSHA standards or other guidance will be cited and applied.

All work practices and procedures implemented on site must be designated to minimize worker contact with hazardous materials and to reduce the possibility of physical injury. All work will be performed in accordance with applicable Federal 29CFR 1910 and 1926 Health and Safety Regulations and the Federal 29CFR 1910.120 Hazardous Waste Site Safety Regulations.

DAILY SAFETY MEETINGS

Daily safety meetings will be held at the start of each shift to ensure that all personnel understand site conditions and operating procedures, to ensure that personal protective equipment is being used correctly and to address worker health and safety concerns.

SITE SAFETY PLAN ACCEPTANCE ACKNOWLEDGMENT

The OSC or designated representative shall be responsible for informing all individuals entering the exclusion zone or decontamination zone of the contents of this plan and ensuring that each person signs the Safety Plan Acknowledgment Form in Attachment Z. By signing the Safety Plan Acknowledgment Form, individuals are recognizing the potential hazards present on-site and the policies and procedures required to minimize exposure or adverse effects of these hazards.

1.0 SITE BACKGROUND AND SCOPE OF WORK

1.1 ROLES AND RESPONSIBILITIES

On-Scene Coordinator (OSC):

The OSC, as the representative of the U.S. EPA, is responsible for overall project administration and for coordinating health and safety standards for all individuals on-site at all times. All U.S. EPA and contractors health and safety guidelines and requirements as well as all applicable OSHA standards shall be applied. The OSC is the overall site safety officer and will be responsible for the health and safety of on-site visitors. However, each contractor (as an employer under OSHA) is also responsible for the health and safety of its employees. If there is any dispute with regards to health and safety, the following procedures shall be followed:

1) Attempt to resolve the issue on-site; and,
2) If the issue cannot be resolved, on-site personnel shall consult off-site health and safety personnel for assistance and the specific task operation in dispute shall be discontinued until the issue is resolved.

Response Manager (RM):

The Response Manager, as the field representative for the ERCS clean-up contractor, has the responsibility for fulfilling the terms of the delivery order. The RM must oversee the project and ensure that all technical, regulatory and safety requirements are met. It is the RM's responsibility to communicate with the OSC as frequently as dictated by the OSC, but at least daily, regarding site clean-up progress and any problems encountered.

Technical Assistance Team (TAT):

The Technical Assistance Team is responsible for providing the OSC with assistance and support in regards to all technical, regulatory and safety aspects of site activity. The TAT is also available to advise the OSC on matters relating to sampling, treatment, packaging, labeling, compatibility, transport, and disposal of hazardous materials, but is not limited to the above-mentioned.

Site Health and Safety Officer (HSO):

The ERCS and TAT Site Safety Officers will be assigned to the site on a full-time basis with functional responsibility for implementing the Site Health and Safety Plan as it applies to ERCS and TAT personnel. The Response Manager is the designated ERCS HSO. The Lead TAT Member is the designated TAT HSO unless otherwise appointed. Site audits may be conducted by the ERCS Health and Safety manager, TAT personnel and/or the U.S. EPA.

Specific Duties Include:

a. Assume responsibility for health and safety of ERCS and/or TAT personnel.
b. Supervise confined space entries.
c. Document safety problems.
d. Supervise decontamination of personnel and equipment.
e. Ensure that monitoring equipment is calibrated/operational.
f. Conduct personal air monitoring on all ERCS and/or TAT employees as outlined in 29CFR 1910.120(h)(4).
g. Perform respiratory fit tests.
h. Inventory/inspect PPE prior to personnel entries.
i. Prepare summary letter of personal air sampling results.
j. Select protective equipment levels based upon chemical properties, method of contact and air sample results.
k. Prepare and maintain OSHA Log within 3 days of accident.
l. Insure all ERCS and/or TAT personnel are fit for duty.
m. Competent person for excavation/trench entry jobs.
n. Inspect first aid kits/fire extinguishers/SCBA.

Other:

Any persons who observe safety problems should immediately report observations/concerns to appropriate key personnel listed in Section 1.2.

SUBCONTRACTORS

COMPANY: ______________________________

CONTACT NAME: ____________________ PHONE: __________

ADDRESS: ______________________________

____

SCOPE OF WORK: ______________________________

____

TRAINING REQUIRED: ______________________________

CONTRACTOR PREQUALIFIED? [___] YES [___] NO

COMPANY: ______________________________

CONTACT NAME: ____________________ PHONE: __________

ADDRESS: ______________________________

____

SCOPE OF WORK: ______________________________

____

TRAINING REQUIRED: ______________________________

CONTRACTOR PREQUALIFIED? [___] YES [___] NO

COMPANY: ______________________________

CONTACT NAME: ____________________ PHONE: __________

ADDRESS: ______________________________

____

SCOPE OF WORK: ______________________________

____

TRAINING REQUIRED: ______________________________

CONTRACTOR PREQUALIFIED? [___] YES [___] NO

1.2 Key Personnel

U.S. EPA On-Scene Coordinator (OSC)/ Site Safety Officer:	Sam Borries U.S. EPA Region V 77 West Jackson Chicago, IL 60604 (312) 353-2886
Alternate OSCs:	_____ _____
Principle ERCS Contractor:	Riedel Environmental Services, Inc. 18207 Edison Avenue Chesterfield, MO 63005 (314) 532-7660
Response Manager (RM):	Ken Braig
Subcontractors:	_____ _____
ERCS Health & Safety Officer:	Greg Rakers
TAT Health & Safety Officer:	_____
Technical Assistance Team (TAT):	Ecology & Environment, Inc. 111 West Jackson Blvd. Chicago, Illinois 60604 (312) 663-9415
TAT Representatives:	_____ _____ _____
Other:	_____ _____ _____

1.3 Site Background

1.3.1 Site Description

The Sauget Landfill site is located in west-central St. Clair County, Illinois, directly across the Mississippi River from St. Louis, Missouri (see Figure 1 - Site Location Map). The DCP site consists of a number of former municipal and industrial waste landfills; surface impoundments or lagoons; surface disposal areas; past excavations thought to be filled or partially filled with unknown wastes; and an areal drainage flowpath known as Dead Creek, which is closed off from the surface water intake at Queeny Avenue.

According to site file information, Site Q is a former subsurface/surface disposal area which occupies approximately 90 acres. The site is located in Sauget and is bordered by DCP site R and the old Sauget Power Plant on the north; the Illinois Central Gulf Railroad and a United States Corps of Engineers (U.S. COE) river levee on the east; agricultural land on the south; and the Mississippi River on the west (see Figure 2 - Site Features Map). Waste disposal activity occurred between 1962 and 1975.

The land surrounding the site is used primarily for industrial purposes. Commercial activities are located northeast of the site. The nearest residential area is approximately 1.5 miles southeast from the site and also 1 mile west from the site across the Mississippi River.

1.3.2 Site History

As recorded in site file information pertaining to previous site investigations, the surface of Site Q is littered with demolition debris and metal wastes. Two ponds are located at the south portion of the site. Surface runoff in this area flows toward the Mississippi River, but periodic flooding has occurred along the southern portion of the site over the past 10 years, most notably in 1977 and 1987. The most recent flooding episode occurred during the summer of 1993 when the entire site was inundated by Mississippi River flood waters. It was observed that debris was present over much of the site.

1.4 Scope of Work for ERCS Contractor

1) Mobilize and set up site.
2) Excavate disintegrated drums and soil.
3) Sample and load out for disposal.

1.5 Scope of Work for TAT

2.0 TASK SAFETY AND HEALTH RISK ANALYSIS

2.1 Task Specific Hazards and Controls

This section is to be addressed in the daily tool box safety meeting as each task is to be attempted. Each Task-Specific Safety Assessment is designed to develop awareness to chemical and physical hazards specific to each task. It would be impractical to repeat in complete detail each control measure and SOP for each job task. Sources and Hazards will be addressed for each job task with reference made to applicable control measures in Sections 2.2, 2.3 and SOP's. The tables in Section 2.2 and 2.3 should be posted in the break area and command post. When the Task-Specific Safety Assessment are discussed additional hazards may need to be addressed.

TASK SPECIFIC SAFETY ASSESSMENT

JOB TASK: Mobilization			
PERSONAL PROTECTIVE EQUIPMENT:			
HAZARD	**SOURCES**	**CONTROL MEASURES**	**REF.**
Cold Stress	Winter Temperatures	Warm break area. Awareness of symptoms.	SOP L
Heavy Equipment	Trac Hoe/Dozer/Trucks	Controlled work area. Experienced operators.	SOP H
Noise	Trac Hoe/Dozer/Trucks	Wear proper hearing protection.	Sect 2.3
Topography	Uneven Slick Terrain Scattered Debris	Beware of slips, trips and falls. Keep work area organized	Sect 2.3
Ergonomics	Lifting and Bending	Proper lifting and bending techniques.	Sect 2.3

TASK SPECIFIC SAFETY ASSESSMENT

JOB TASK: Excavation

PERSONAL PROTECTIVE EQUIPMENT: Level C Laborers/Level D Operators

HAZARD	SOURCES	CONTROL MEASURES	REF.
Heavy Equipment	Trac Hoe/Dozer/Trucks	Controlled work area. Experienced operators.	SOP H
Noise	Trac Hoe/Dozer/Trucks	Wear proper hearing protection.	Sect 2.3
Topography	Uneven Slick Terrain/Scattered Debris	Beware of slips, trips and falls. Keep work area organized.	Sect 2.3
Water	Mississippi River	Wear life jackets when within 20 feet of water.	
Cold Stress	Winter Temperatures	Warm break area. Awareness of symptoms.	SOP L
Ergonomics	Lifting and Bending	Proper lifting and bending techniques.	Sect 2.3
Dust	Excavation Material	Use water if visible dust is detected.	
Excavation	Excavation	No one enter if > 4 foot. Proper sloping.	SOP I

TASK SPECIFIC SAFETY ASSESSMENT

JOB TASK: Truck Loading

PERSONAL PROTECTIVE EQUIPMENT: Level C Laborers/Level D Operators

HAZARD	SOURCES	CONTROL MEASURES	REF.
Heavy Equipment	Trac Hoe/Trucks	Controlled work area. Experienced operators.	SOP H
Noise	Trac Hoe/Trucks	Wear proper hearing protection.	Sect 2.3
Cold Stress	Winter Temperatures	Warm break area. Awareness of symptoms.	SOP L
Topography	Uneven Slick Terrain/Scattered Debris	Beware of slips, trips and falls. Keep work area organized.	Sect 2.3
Ergonomics	Lifting and Bending	Use proper lifting and bending techniques.	Sect 2.3
Trucks	Truck Loading	Controlled work area.	SOP J

TASK SPECIFIC SAFETY ASSESSMENT

JOB TASK:			
PERSONAL PROTECTIVE EQUIPMENT:			
HAZARD	**SOURCES**	**CONTROL MEASURES**	**REF.**

TASK SPECIFIC SAFETY ASSESSMENT

JOB TASK:			
PERSONAL PROTECTIVE EQUIPMENT:			
HAZARD	**SOURCES**	**CONTROL MEASURES**	**REF.**

TASK SPECIFIC SAFETY ASSESSMENT

JOB TASK:			
PERSONAL PROTECTIVE EQUIPMENT:			
HAZARD	**SOURCES**	**CONTROL MEASURES**	**REF.**

TASK SPECIFIC SAFETY ASSESSMENT

JOB TASK:			
PERSONAL PROTECTIVE EQUIPMENT:			
HAZARD	**SOURCES**	**CONTROL MEASURES**	**REF.**

2.2 Chemical Hazards

CHEMICAL	TLV/PEL/ IDLH	Physical Characteristics	Odor Threshold	Routes of Exposure	PPE Polymers	Symptoms Acute/Chronic	First Aid
PCB's	.5 mg/m^3	Solid	NA	Skin/Inhalation	Nitrile	Chronic	Flush with water.
Phenol	19 mg/m^3	Solid/Liquid	1 ppm	Skin/Inhalation	Nitrile	Skin	Flush with water.
Dichlorobenzene	451 mg/m^3	Solid/Liquid	1 ppm	Inhalation	Nitrile	Headache/dizziness	Fresh air.
Trichlorobenzene	37 mg/m^3 ceiling	Solid/Liquid	3 ppm	Inhalation	Nitrile	Headache/dizziness	Fresh air.

The above listing should not be taken as a complete assessment of the hazards posed by materials at Sauget Landfill. The known and unknown mixed chemical hazards at this site prevent a clear determination of the specific effects of discrete compounds. Therefore, personnel must be alert for symptoms of possible exposure such as unusual smells, stinging, burning eyes, nose and throat, skin irritation, as well as feeling extremely well, depressed, sleepy or tired. Symptoms must be immediately reported to the site supervisor.

See Attachment C for Chemical Hazard Information and MSDS'.

2.3 Physical Hazards

PHYSICAL/ENVIRONMENTAL HAZARD ANALYSIS

HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Cold Stress	1. Anticipate possible low temperatures (winter months). 2. Remember the temperature does not have to be below freezing to have a cold stress situation.	1. Warm break area. 2. Warm decaffeinated drinks. 3. Buddy system/awareness. 4. First aid on site. 5. Medical care if symptoms persist.
Electrical	1. Locate and mark existing energized lines. 2. De-energize lines if necessary to perform work safely. 3. All electrical circuits will be grounded. 4. All 120 volt single phase which are not a part of the permanent wiring will have a ground-fault interrupter in place. 5. Temporary wiring will be guarded, buried or isolated by elevation to prevent accidental contact by personnel or equipment. **6. Evaluate potential for high moisture/standing water areas and define special electrical wiring needs-typically requirement for low voltage lighting systems.**	
Ergonomic	1. All operations evaluated for ergonomic impact. 2. Procedures written to define limits of lifting, pulling, etc. 3. Procedures to define how personnel will utilize proper ergonomic concepts and utilize mechanical material handling equipment. 4. Necessary mechanical material handling equipment specified and ordered for project.	1. Proper body mechanics techniques stressed and enforced on a daily basis. 2. Mechanical handling equipment maintained and utilized. 3. Proper body mechanics stressed in scheduled safety meetings. 4. Injuries reported and medically treated if in doubt about severity. 5. Operations changed as necessary based on injury experience or potential.
Existing Site Topography	1. Survey site prior to layout. Identify areas unsafe for personnel or equipment due to physical conditions. 2. Identify/locate existing utilities. 3. Determine impact of site operations on surrounding properties, communities, etc. 4. Identify mechanized equipment routes both on site and onto and off the site. 5. Layout site into exclusion and contamination reduction zones based on initial site evaluation.	1. Awareness to work environment - regular inspection/audits to identify changing conditions. 2. Shut down operations when unknown conditions encountered.

PHYSICAL/ENVIRONMENTAL HAZARD ANALYSIS

HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Fires & Explosions	1. Evaluate all operations for fire and explosion potential. 2. Define specific procedures for unique operations presenting unusual hazard such as flammable tank demolition. 3. Ensure that properly trained personnel and specialized equipment is available. 4. Define requirements for handling and storage of flammable liquids on site, need for hot work permits and procedures to follow in the event of fire or explosion. 5. Define the type and quantity of fire suppression equipment needed on site. 6. Coordinate which local fire fighting agencies to discuss unique fire hazards, hazardous materials, etc. 7. Ensure site operations comply with 29CFR 1910.157G.	1. Inspect fire suppression equipment on a regular basis. 2. Store flammables away from oxidizers and corrosives. 3. Utilize Hot Work Permit for all hot work on site. 4. Follow any site specific procedures regarding work around flammables. 5. Review and practice contingency plans. Discuss on regular basis at scheduled safety meetings.
Flammable Vapor and Gases	1. **Evaluate site to determine sources of likely flammable gas or vapor generation.** 2. **Develop specific procedures to be followed in the event of exposure to flammables.** 3. Specify specialized equipment needs for inerting flammable atmospheres, ventilating spaces and monitoring flammable vapor concentrations. 4. Define requirements for intrinsically safe equipment. 5. Develop contingency plan to follow in the event of fire or explosion.	1. **Calibrated monitoring equipment available and utilized by trained personnel whenever working where flammable gas or vapor is present.** 2. **Monitoring performed at regular frequency and in all areas where vapor could generate or pool.** 3. Equipment and operations shut down when threshold levels are exceeded. 4. Contingency plans reviewed regularly by all involved personnel. 5. Work areas are carefully inspected to look for possible ignition sources. Sources are removed. 6. Operations shut down if specific task procedures can't be followed to the letter.
Heat Stress	1. Anticipate possible elevated temperatures (summer months). 2. Awareness to stress placed on body by specific PPE. 3. Awareness to levels of heat stress symptoms.	1. Proper work/rest schedule and monitoring. 2. Drink plenty of fluids. 3. Buddy system/awareness. 4. First aid on site. 5. Medical care if symptoms persist.

PHYSICAL/ENVIRONMENTAL HAZARD ANALYSIS

HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Heavy Equipment Operation	1. Define equipment routes and traffic patterns for site. 2. Insure that operators are properly trained on equipment operation for all equipment required on project. 3. Define safety equipment requirements, including back up alarm and roll over, for all equipment on site. 4. Define equipment routes and traffic patterns for site. 5. Implement SOP of requiring operators to safety inspect equipment on a daily basis in accordance with manufacturer requirements. 6. Evaluate project requirements to ensure that equipment of adequate capacity is specified.	1. Equipment inspected as required. Equipment repaired or taken out of service. 2. Ground spotters are assigned to work with equipment operators. Utilize standard hand signals and communication protocols. 3. Personnel wear the proper PPE, utilize hearing protection, gloves for handling rigging, etc. 4. Equipment safety procedures discussed at daily scheduled safety meetings. 5. Personnel do not exceed lifting capacities, load limits, etc. for equipment in question. 6. Personnel follow basic SOP's which prohibit passengers on equipment, activating brakes and grounding buckets, securing loads prior to movement, etc.
Illumination	1. **Evaluate all operations and work areas to determine lighting requirements.** 2. **Specify specialized lighting requirements including explosion proof, intrinsically safe, lighting needs.** 3. Determine if nighttime outdoor operations are necessary. Evaluate tasks to be performed and number of light plants necessary to allow operations. 4. Ascertain if outdoor lighting from nighttime operations will have an impact on surrounding communities.	1. **Inspect specialized equipment and discard or replace as needed.** 2. **Add additional lighting to areas with lighting deficiencies.** 3. Inspect drop cords and portable lights on regular basis. Replace or repair as necessary.
Noise	1. Local community noise standards examined. 2. Expected loud operations evaluated to determine compliance with community standards. 3. Loud operations scheduled for approved time periods. 4. Noise level standards established for equipment brought onto site. 5. Hearing protection requirements defined for personnel expected to have excessive exposures.	1. Personnel receive annual audiogram. 2. Personnel required to wear hearing protection. 3. Routine noise level monitoring and dosimetry performed. 4. Defective equipment repaired as needed. 5. Ongoing hearing conservation education promoted at scheduled safety meetings. 6. Medical evaluation following noise (impact) exposure if symptoms present themselves.

PHYSICAL/ENVIRONMENTAL HAZARD ANALYSIS

HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Personal Injuries	1. Site operations will be evaluated for exposures with serious injury potential such as falling objects, pinch points, flying objects, falls from elevated surfaces, etc. 2. A written Fall Prevention Program will be developed if workers will be required to work at heights greater than 10 feet from unguarded work locations. 3. PPE requirements will be based on potential for injury.	1. Personnel will wear required PPE. 2. Specialized equipment such as rope grabs, winches, etc. will be inspected prior to each use. Defective equipment will be immediately replaced. 3. All injury and near miss incidents will be reported to the HSO. 4. First aid/CPR trained person on site at all times. 5. All injuries will be treated on site with advanced medical treatment being sought if doubt about severity.
Radiation	1. Evaluate potential for exposure to radioactive materials. 2. If likely, develop specialized training program for personnel. 3. Develop plan and specify equipment for monitoring potential radiation sources. 4. Establish health physics dosimetry program. 5. If not likely, implement SOP of stopping work should any sign of radioactive materials become apparent.	1. Perform monitoring as defined in safety plan. 2. Perform necessary calibration and maintenance on monitoring equipment. 3. Employees participate in health physics monitoring program. 4. Notify Project Manager when suspect materials are detected.
Small Equipment Usage	1. Site operations evaluated to determine need for specialized intrinsically safe, explosion-proof and UL approved equipment and instruments. 2. Implement requirement for G.F.I., double insulated tool usage, or assured grounding program in all outdoor operations, will be utilized. 3. Specify equipment needs to ensure that equipment used only for the purpose for which it is designed and to prevent abuse or misuse of the equipment. 4. Specify requirements for the inspections and maintenance of specialized equipment. 5. Specify that all equipment utilized on the project meets all OSHA requirements.	1. First aid on site. 2. Transport for medical care if necessary.
Wildlife	1. Inspect work environment where tasks are being performed. 2. Awareness to bites. 3. Dogs, animals, poison ivy, etc.	1. First aid on site. 2. Seek medical attention if symptoms-signs persist.

PHYSICAL/ENVIRONMENTAL HAZARD ANALYSIS

HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Trenching and Excavation	1. Implement ERCS excavation procedures if entry required into any excavation greater than 4 feet depth. 2. Specify that Competent Person(s) assigned to project be present at all times personnel inside trench(s). 3. Specify that a Professional Engineer design specialized shoring systems for those that are extremely deep. 4. Specify special PPE and monitoring requirements for excavations in soils contaminated with hazardous materials or gases and vapors. 5. Ensure excavations comply with 29CFR 1926, Subpart P.	1. Competent person in the immediate area at all times that personnel are required to enter trenches. 2. Operations shut down if the excavation shows any sign of cave in, excessive water, unacceptable levels of toxic contaminants, changing weather, or shoring systems have visible defects. 3. Equipment operators keep all personnel inside excavation in sight. No suspended loads or movement of buckets over personnel. 4. Regular monitoring is performed in excavations where toxic gases or vapors are possible.
Weather Conditions	1. Evaluate prevailing weather conditions for the site. 2. Contingency plans developed for likely severe weather conditions such as tornado, and extreme thunderstorm. 3. Provide for daily weather forecast service in extreme weather areas. 4. Plan to weatherize safety systems, such as showers and eye washes, that would be impacted by extreme cold weather. 5. Order necessary specialized cold weather clothing. 6. Grounding and bonding requirements defined for thunderstorm areas. 7. Sheltered air conditioned break areas provided for extreme hot and cold weather zones.	1. Employees trained in contingency plan for severe weather conditions. 2. Emergency water sources inspected regularly in cold areas. 3. Weather service contacted regularly during storm conditions. 4. Supervisory personnel cease operations during extreme storm conditions (i.e., thunderstorms). Personnel evacuate to safe assembly area.

3.0 PERSONNEL TRAINING

[1] Initial Training

a. 40 Hour Training

All field employees receive forty hours of classroom training on safe work practices and hazardous waste sites.

b. Supervisor/Managers

Manager and Supervisors receive eight hours of training on safe management of hazardous waste sites. All training complies with 29CFR 1910.120.

The following individuals are Site Supervisors:

[1] Sam Borries
[2] Ken Braig

[2] Site Specific Training

a. All assigned personnel will receive site specific training on routes of exposure and adverse health effects associated with the chemicals listed on the attachment.

b. At least one member of each work crew shall have training in the use of portable fire extinguishers in accordance with 29CFR 1910.157G.

c. IAW 29CFR 1910.120, all personnel newly assigned to hazardous waste work will receive 3 days of on the job training by an experienced supervisor. This typically is achieved by coordinating the work schedule so that they perform 25% of the expected workload the first day; 50% the second day, and 75% the third day.

d. Each person entering the site shall sign a statement attesting to the fact that they have read and understand the Site Specific Safety Plan. (Attachment Z)

[3] Annual Refresher

All field employees receive eight hours of refresher training on the above topics within the anniversary date of their initial 40 hour class.

[4] First Aid/CPR

All field employees receive initial and recertification training. Treatment limited to Good Samaritan/minor first aid. All traumatic/major first aid, and cardiac problems will be referred to medical facilities.

[5] Subcontractor Requirements

All subcontractors entering the contamination reduction zone and exclusion zone will have adequate training satisfying 29 CFR 1910.120.

4.0 PERSONAL PROTECTIVE EQUIPMENT

The following is a brief description of the personal protective equipment which may be required during various phases of the project. The U.S. EPA terminology for protective equipment will be used; Levels A, B, C and D.

Respiratory protective equipment shall be NIOSH-approved and use shall conform to OSHA 29 CFR Part 1910.134 Requirements. Each employer shall maintain a written respirator program detailing selection, use, cleaning, maintenance and storage of respiratory protective equipment. The written Respirator Program will be maintained at the local and regional offices.

4.1 Level A Protection Shall Be Used When:

- The extremely hazardous substance requires the highest level of protection for skin, eyes and the respiratory system;
- Substances with a high degree of hazard to the skin are known or suspected;
- Chemical concentrations are known to be above IDLH levels; or,
- Biological hazards requiring Level A are known or suspected.

4.2 Level B Protection Shall Be Used When:

- The substance(s) has been identified and requires a high level of respiratory protection but less skin protection;
- Concentrations of chemicals in the air are IDLH or above the maximum use limit of an APR with full-face mask;
- Oxygen deficient or potentially oxygen deficient atmospheres (<19.5%) are possible; and/or,
- Confined space entry may require Level B.
- Incomplete identification of gases and vapors, but not suspected to be harmful to skin or skin absorbable.

4.3 Level C Protection Shall Be Used When:

- The same level of skin protection as Level B, but a lower level of respiratory protection is required;
- The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove contaminants; or,
- The substance has adequate warning properties and all criteria for the use of APR respirators has been met.

4.3.1 Level C Protective Equipment at a Minimum Shall Consist of:

Protective Gear - Level C	(Check and list required type)
MSA Air Purifying Respirator or PAPR	Fullface
Cartridges (type)	GMC-H
Escape Mask	
Chemical Resistant/Protective Coveralls (type)	Tyvek-dry/Saranex-liquid
Full Body Apron or Other (type)	
Inner Gloves (type)	Nitrile
Outer Chemical Gloves (type)	Nitrile
Outer Work Gloves (type)	
Safety Shoes/Boots (type)	Steel toed chemical resistant
Hard Hat	X
Respiratory Inserts	
Other (List_____)	
Other (List_____)	
Other (List_____)	
Other (List_____)	

Modifications: Life jacket if working within 20 feet of river.

4.4 Level D Protection Shall Be Used When:

- The atmosphere contains no known hazard; and,
- Work functions preclude splashes, immersion or the potential for unexpected inhalation of, or contact with, hazardous concentrations of harmful chemicals.

4.4.1 Level D Protection Equipment at a Minimum Shall Consist of:

Protective Gear - Level D	(Check and list required type)
Chemical Resistant/Protective Coveralls (type)	Tyvek
Rain Suit	
Safety Shoes/Boots (type)	Steel toed
Boot Covers (booties)	As needed
Work Gloves (type)	
Hard Hat	X
Face Shield	
Safety Glasses	

Modifications: Life jacket if working within 20 feet of river.

Specific operating procedures for PPE and Respiratory Protection are in Attachment D.

4.5 Decisions to Upgrade/Downgrade PPE

[1] All decisions to downgrade from Level B to C or D must be accompanied by air monitoring results. The Regional Safety Managers (ERCS, TAT) must be advised of on-site decisions to downgrade. All decisions must be documented with an Addendum to the Plan.

[2] The following conditions will necessitate reevaluation of PPE use.

a. commencement of a new work not previously identified
b. change of job tasks during a work phase
c. change of season/weather
d. contaminants other than those identified in Safety Plan
e. change in ambient levels of contaminants
f. change in work which affects degree of chemical contact

[3] Action Levels (See Section 6.0)

5.0 MEDICAL SURVEILLANCE

5.1 Pre-Employment Physical

a. Pre-employment and periodic update medical examinations are required for persons working at hazardous waste sites.
b. All physicals must be completed and documented prior to assignment to this site.
c. All physical exams will be conducted following parameters established by the respective employee's Corporate Physicians.

5.2 Site Specific Physical Examination

a. N/A
b. _____
c. A current Fitness for Duty statement will be kept on site for all ERCS personnel.

5.3 Annual Physical Exam

The medical examination must have been within a 12-month period prior to on-site activity and repeated annually.

5.4 Accidental/Suspected Exposure Physical

a. Following any accidental or suspected uncontrolled exposure to site contaminants, personnel should be scheduled for a special physical examination.
b. The physical examination will be specific for the contaminants and the associated target organs or physiological system.

c. N/A

d. Questions regarding the type of physical can be directed to the employer's Directors of Health and Safety or their Corporate Physicians. See Section 10.2 for their respective phone numbers.

5.5 Contractor Physical Examination Requirements

All subcontractors entering the contamination reduction or exclusion zone will have adequate medical surveillance satisfying 29CFR 1910.120.10 (f).

5.6 Site Documentation

All personnel on-site must have the following documentation available on site:

[1] Copy of 40 hour certificate
[2] Copy of Manager's/Supervisor's 8 hour certificate
[3] Copy of 8 Hour Annual Refresher (if > 12 months since 40 hour)
[4] CPR/First Aid Certificate (annual)
[5] Respirator Fit Test (annual)
[6] Medical Fitness For Duty
[7] Memorandum of Understanding & Consent (RES only)
[8] Worksite Exposure Documentation

6.0 AIR MONITORING AND ACTION LEVELS

According to 29 CFR 1910.120 (h) Air Monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on-site.

6.1 Routine Air Monitoring Requirements

- Upon initial entry to rule out IDLH conditions;
- When the possibility of an IDLH condition or flammable atmosphere has developed;
- When work begins on a different portion of the site;
- Contaminants other than those previously identified are being handled;
- A different type of operation is initiated;
- Employees are handling leaking drums or containers or working in areas with obvious liquid contamination; and,
- During confined space work.

Air monitoring will consist at a minimum of the criteria listed below. All air monitoring data will be documented and submitted to the OSC and available in the command post site files for review by all interested persons. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications. Calibration and maintenance performed will be entered in the site log and/or instrument log book.

6.2 Site Specific Air Monitoring Requirements

INSTRUMENT	COMPOUNDS TO DETECT	FREQUENCY	COMMENTS/ ACTION LEVEL
Combustible Gas Indicator (CGI)	Explosive/ Flammable Atmospheres	N/A	> 10% LEL
PID/FID	Organic Vapors and Gases	Scan excavation	Unidentified contaminants* < Background units - Level D Background-5 units - Level C 5-500 units - Level B
Asbestos/Fiber Monitoring	Asbestos	N/A	> 0.01 fibers/cc for PCM > 70 structures/mm^2 for TEM > 1% asbestos/weight bulk sample
Jerome Mercury Analyzer	Mercury Vapors	N/A	> .025 mg/m^3
Detector Tubes	Various	N/A	
Radiation Meter	Radiation	N/A	> 2 mR/hr
Oxygen Meter	Oxygen	N/A	<19.5% and >23.5% O^2
Other:			

* The reading must be sustained for one (1) minute in the breathing zone.

6.3 Personnel Monitoring

Explain strategy or why not required: At start up, all material is solid and wet, therefore personnel air monitoring will not be conducted unless conditions change.

7.0 SITE CONTROL AND STANDARD OPERATING PROCEDURES

7.1 Work Zones

The primary purpose for site controls is to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas and to prevent access or exposure to hazardous materials by unauthorized persons. At the end of each workday, the site should be secured or guarded, to prevent unauthorized entry. Site work zones will include:

7.1.1 Clean Zone/Support Zone

This uncontaminated support zone or clean zone will be the area outside the exclusion and decontamination zones and within the geographic perimeters of the site. This area is used for staging of materials, parking of vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the exclusion zone. All personnel arriving in the support zone will upon arrival, report to the command post and sign the site entry/exit log. There will be one controlled entry/exit point from the clean zone to the decontamination zone.

[1] Location of Clean Zone outside of Banner guard

7.1.2 Decontamination Zone

The decontamination zone will provide a location for removal of contaminated personal protective equipment and final decontamination of personnel and equipment. All personnel and equipment should exit via the decon area. A separate decontamination area will be established for heavy equipment.

[1] The decontamination zone is a buffer zone between contaminated and clean areas.
[2] Identified by yellow banner guard.
[3] Decon line is located east of excavation

7.1.3 Exclusion Zone/Hot Zone

The exclusion zone will be the "hot-zone" or contaminated area inside the site perimeter. Entry to and exit from this zone will be made through a designated point and all personnel will be required to sign the hot zone entry/exit log located at the decon area. Appropriate warning signs to identify the exclusion zone should be posted (i.e. "DANGER - AUTHORIZED PERSONNEL ONLY", "PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT", etc.) Exit from the exclusion zone must be accompanied by personnel and equipment decontamination as described in Section 8.0.

[1] Will be identified by red banner guard. ✓

[2] These areas will be defined by red banner guard

[3] General Safety Rules for Exclusion Zone
- a. wear the appropriate level of PPE defined in plan
- b. do not remove any PPE or break the integrity to pick, scratch, or touch parts of your body
- c. no smoking, eating or drinking
- d. no horseplay
- e. no matches or lighters in this zone
- f. implement the communication and line of sight system

A map of the work zones for this site follows.

7.2 General Field Safety Rules

- All visitors must be sent to the command post and referred to the OSC.
- It is EPA policy to practice administrative hazard control for all site areas by restricting entrance to exclusion zones to essential personnel and by using operational SOPs.
- Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or set equipment on the ground. Stay away from any waste drums unless necessary. Protect equipment from contamination by bagging.
- Eating, drinking, or smoking is permitted only in designated areas in the support zone.
- Hands and face must be thoroughly washed upon leaving the decon area.
- Beards or other facial hair that interferes with respirator fit will preclude admission to the hot zone.
- All equipment must be decontaminated or discarded upon exit from the exclusion zone, as determined by the OSC or designate.
- All personnel exiting the exclusion zone must go through the decontamination procedures described in Section 8.0.

6.3.1 Sampling Methods (media type, analyses, NIOSH Method Number, etc.):_____

6.3.2 Describe calibration procedures:_____

6.3.3 Analytical laboratory to be used:_____

6.4 Noise Monitoring: [ ] Yes [X] No

Describe monitoring strategy:_____

6.5 Heat Stress Monitoring: [ ] Yes [X] No

Describe monitoring strategy:_____

6.6 Perimeter: [ ] Yes [X] No

Describe:_____

Other: [ ] Yes [ ] No

Describe:_____

6.7 Name(s) of Monitoring Technician(s):

Steve Skare

Sammy Sirhan

6.8 Location of Monitoring Records:

Copies of monitoring records will be retained in the job file upon the completion of the job. Additional copies will be maintained in the Health and Safety Department.

- Safety Equipment described in Section 4.0 will be required for all field personnel.

- Personnel will only travel in vehicles where individual seats (for each occupant are provided. Seat belts will be worn as required.

- Fire extinguishers will be available on site and in all areas with increased fire danger such as the refueling area.

- A minimum of two personnel will always be on site whenever heavy equipment is operated. Only necessary personnel need to be on or around heavy equipment.

- Employees will not interfere with or tamper in any way with air monitoring equipment.

- Backhoes or other equipment with booms shall not be operated within 10 feet of any electrical conductor.

- Visitor log will be maintained at the command post or with the security guard. All personnel coming on site will sign in and out on a daily basis.

- Security will be maintained at the site by closing all gates during normal work hours. The OSC will assume responsibility for personnel entering site. Site will be locked up in the evening.

- EPA OSC will allow only those individuals authorized to enter the site. If unauthorized members of the public are found on site, contact security immediately and do not leave the individual unattended.

- Visitors are not allowed in the work areas without authorization and not without appropriate levels of PPE as determined by site safety personnel. Access to the properties is restricted to the EPA and authorized representatives. Persons other than the residents must sign in at the Command Post and receive authorization to enter the site.

- Buddy System
  [1] The buddy system is mandatory at anytime that personnel are working in the exclusion zone, remote areas, on tanks, or when conditions present a risk to personnel.
  [2] A buddy system requires at least two trained/experienced people who work as a team and maintain at a minimum audible and/or visual contact while operating in the exclusion zone.

- Communication Procedures
  [1] Radios will be used for on site communications and Channel 2 will be the designated channel.
  [2] The crews should remain in constant radio or visual contact while on site.

[3] The site evacuation signal will be 3 blasts on the air or vehicle horn.

8.0 DECONTAMINATION PROCEDURES

In general, everything that enters the exclusion zone at this site, must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel, including any state and local officials must enter and exit the hot zone through the decon area. Prior to demobilization, contaminated equipment will be decontaminated and inspected by the OSC or OSC designate before it is moved into the clean zone. Any material that is generated by decontamination procedures will be stored in a designated area in the exclusion zone until disposal arrangements are made.

All personnel must be documented on the "HOT ZONE ENTRY/EXIT LOG" when entering and exiting the exclusion zone.

NOTE: The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for this site is water. Decontamination solution will be changed daily (at a minimum) and collected and stored on-site until disposal arrangements are finalized.

8.1 Procedures for Equipment Decontamination

Following decontamination and prior to exit from the hot zone, the OSC or a designated alternate, shall be responsible for insuring that the item has been sufficiently decontaminated. This inspection shall be included in the site log.

Equipment decontamination will consist of the following steps:
Wash with water. and rinse
Scrub material off all surfaces if necessary to wash.

8.2 Procedure for Personnel Decontamination

This decontamination procedure applies to personnel at this site wearing Level B and C protection. These are the minimum acceptable requirements:

Station 1: Equipment Drop
Deposit equipment used on-site (tools, sampling devices and monitoring instruments, radios, etc.) on plastic drop cloths. These items must be decontaminated or discarded as waste prior to removal from the exclusion zone.

Station 2: Outer Boot and Outer Glove Wash and Rinse
Scrub outer boots, outer gloves and/or splash suit with decontamination solution or detergent water. Rinse off using water.

Station 3: Outer Boot and Glove Removal
Remove outer boots and gloves. If outer boots are disposable, deposit in container with plastic liner. If non-disposable, store in a clean dry place.

Station 4: Tank Change
If person leaves exclusion zone to change air tank, this is the last step in the decontamination procedure. Air tank is exchanged, new outer gloves and boot covers donned, joints taped, and person returns to hot zone.

Station 5: Outer Garment Removal
If applicable, remove SCBA back-pack and remain on air as long as possible. Remove Chemical Resistant Outer Garments and deposit in container lined with plastic. Decontaminate or dispose of splash suits as necessary.

Station 6: Respiratory Protection Removal
Remove hard-hat, face-piece, and if applicable, deposit SCBA on a clean surface. APR cartridges will be discarded as appropriate. Wash and rinse respirator at least daily. Wipe off and store respiratory gear in a clean, dry location. (See Attachment D)

Station 7: Inner Glove Removal
Remove inner gloves. Deposit in container for disposal.

Station 8: Field Wash
Thoroughly wash hands and face with soap and water. Shower as soon as possible.

Eating, drinking, chewing gum/tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and/or ingestion of materials is prohibited in any areas where the possibility of contamination exists and is permitted only in the designated break area.

Personnel will not wear or bring dirty/decontaminated clothing into the break areas.

8.3 Emergency decontamination will consist of the following steps:
(Any blood contaminated material will be bag, labeled and accompany the individual to the hospital.)

8.4 The following decontamination equipment is required:
Water, brushes, Alconox

8.5 Disposition of Decontamination Wastes

[1] All equipment and solvents used for decontamination shall be decontaminated or disposed of with the established waste streams.

[2] Commercial laundries or cleaning establishments that decontaminate or are used to launder contaminated clothing shall be informed of the presence and potentially harmful effects of the contaminants.

[3] N/A

A sketch of the decon area for this site is shown in Attachment B.

9.0 HAZARD COMMUNICATION PROGRAM

Each contractor will be responsible for maintaining a copy of their Hazardous Communication Program and MSDS' on site. The following items are specific to this job site:

9.1 Material Safety Data Sheets

[1] Material Safety Data Sheets will be maintained at the Command Post in the Health and Safety Binder.

[2] MSDS' will be available to all employees for review during the work shift.

[3] See Attachment C and/or the ERCS Health and Safety Binder.

9.2 Container Labeling

[1] All containers received on site will be inspected by the contractor using the material to ensure the following:

a. all containers clearly labeled
b. appropriate hazard warning
c. name and address of the manufacturer

9.3 The following chemicals were brought to the site:

[1] Alconox
[2] Gasoline
[3] Diesel Fuel
[4] MSA Sanitizer
[5]
[6]

9.4 Employee Training and Information

[1] Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following:

a. an overview of the requirements contained in the Hazardous Communication Standard
b. Hazardous chemicals present at the site
c. the location and availability of the written Haz Comm Program
d. physical and health effects of the hazardous chemicals

e. methods of preventing or eliminating exposure
f. emergency procedures to follow if exposed
g. how to read labels and review MSDS' to obtain information
h. location of MSDS file and location of hazardous chemical list

See ERCS Health and Safety Binder for Hazard Communication Program and applicable MSDS'.

10.0 EMERGENCIES/ACCIDENTS/INJURIES

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms; illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies. Emergency information should be posted as appropriate.

10.1 Emergency Contacts for Sauget Landfill Site

Fire: 911 Sauget

Police: 911 Sauget

Sheriff: 911 St. Clair

Ambulance: 911 Sauget

*Hospital: St. Louis University

Address: Grand at Vista, St. Louis, MO

Telephone: (314) 577-8000 Chemical Trauma Capabilities? Yes

Poison Control Center: (800) 552-2022

*Directions from Site to Hospital (See Map in Attachment B):

Take entrance road back to Route 3. Turn left and go 1 mile. Take I-64 west and cross bridge. Take I-55 south 1 mile to I-44 west. Take I-44 west 2 miles to the Grand exit and turn right and go 1/2 mile. Hospital is on left.

NOTE: Maps and directions to the hospital will be posted in the office trailer.

e. methods of preventing or eliminating exposure
f. emergency procedures to follow if exposed
g. how to read labels and review MSDS' to obtain information
h. location of MSDS file and location of hazardous chemical list

See ERCS Health and Safety Binder for Hazard Communication Program and applicable MSDS'.

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NOTE: Maps and directions to the hospital will be posted in the office trailer.

The route to the hospital was verified by: Greg Rakers on February 16, 1995. Distance from site to hospital is 5 miles. Approximate driving time is 8 minutes.

The following individuals have been trained in CPR and First Aid:

Ken Braig	Sam Borries
	Sammy Sirhan

10.2 Additional Emergency Numbers

National Response Center	800-424-8802
U.S. EPA Region V - E.R. Branch	312-353-2318 (24 hr)
Center for Disease Control	404-488-4100 (24 hr)
AT&F (Explosives Information)	800-424-9555
Chemtrec	800-424-9300
State Environmental Agency	615/ 346-5120

Ecology & Environment, Inc. Contacts

E & E Regional Office (for this site)	
E & E MEDTOX Emergency Medical Hotline	501-221-0463 (24 Hr.)
	904-462-3277/3281
Dr. Harbison (Home)	501-370-8263
E & E Corporate H & S - Dr. Paul Jonmaire	716-684-8060
E & E Emergency Operations Center Hotline	716-684-8940 (24 Hr.)
	716-684-8060
TAT Leader Region V - Thomas Kouris	312-663-9415

Riedel Environmental Services, Inc. Contacts

Riedel Environmental Services	800-334-0004 (24 Hr.)
Riedel Environmental Services (Chicago)	708-671-0061
Riedel Environmental Services (St. Louis)	314-532-7660
RES Corporate H & S - Margaret Cunningham	800-334-0004

EPA

Federal Occupational Health Unit	312-353-0379

10.3 Emergency Equipment Available On-Site

Communications Equipment	Location
Public Telephones:	N/A
Private Telephones:	(18) 274-1222 River City Landscape
Mobile Telephones:	(2) E+E + RES
Two-Way Radios:	~~4~~ 4 hand held
Emergency Alarms/ Horns:	Auto horn

Medical Equipment

First Aid Kits:	1/truck VAN
Inspection Date:	2-22-95 By:
Stretcher/Backboard:	No
Eye Wash Station: (within 100 feet of hazard zone)	●
Safety Shower:	

Fire-Fighting Equipment

Fire Extinguishers:	2 CO_2
Inspection Date:	2/95 By:
Other:	

Spill or Leak Equipment

Absorbent Boom/Pads:	N/A
Dry Absorbent:	N/A

Additional Emergency Equipment

10.4 Accident Reporting/Investigations (See Attachment F for proper procedures.)

11.0 EMERGENCY RESPONSE CONTINGENCY PLAN

11.1 Project Personnel Responsibilities During Emergencies

ON-SCENE COORDINATOR (OSC)

As the administrator of the project, the OSC has primary responsibility for responding to and correcting emergency situations. The OSC will:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, total evacuation and securing of the site or up-grading or down- grading the level of protective clothing and respiratory protection.
- Take appropriate measures to protect the public and the environment including isolating and securing the site, preventing run-off to surface waters and ending or controlling the emergency to the extent possible.
- Ensure that appropriate Federal, State and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted.
- Ensure that appropriate decon treatment or testing for exposed or injured personnel is obtained.
- Determine the cause of the incident and make recommendations to prevent the recurrence.
- Ensure that all required reports have been prepared.

RESPONSE MANAGER (RM)

The RM must immediately report emergency situations to the OSC, take appropriate measures to protect site personnel and assist the OSC as necessary in responding to and mitigating the emergency situation.

TECHNICAL ASSISTANCE TEAM (TAT)

The TAT must immediately report emergency situations to the OSC, take appropriate measures to protect site personnel and assist the OSC as necessary.

11.2 Medical Emergencies:

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket.) First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the OSC.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and information on the chemical(s) they may have been exposed to. This information is included in Table 2.3. Any vehicle used to transport contaminated personnel, will be cleaned or decontaminated as necessary.

11.3 Fire or Explosion:

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival the OSC or designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on- site.

If it is safe to do so, site personnel may:

- Use fire fighting equipment available on site.
- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

11.4 Spills, Leaks or Releases:

In the event of a spill or a leak, site personnel will:

- Locate the source of the spillage and stop the flow if it can be done safely.
- Begin containment and recovery of the spilled materials.

11.5 Evacuation Routes and Resources:

Evacuation routes have been established by work area locations for this site. All buildings and outside work areas have been provided with two designated exit points. Evacuation should be conducted immediately, without regard for equipment under conditions of extreme emergency. See site map for evacuation routes.

- Evacuation notification will be three blasts on an air horn, vehicle horn, or by verbal communication via radio.
- Keep upwind of smoke, vapors or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation is not via the decontamination corridor, site personnel should remove contaminated clothing once they are in a location of safety and leave it near the exclusion zone or in a safe place.
- The OSC will conduct a head count to insure all personnel have been evacuated safely.
- In the event that emergency site evacuation is necessary, all personnel are to:

  1. Escape the emergency situation;
  2. Decontaminate to the maximum extent practical; and,
  3. Meet at the U.S. EPA command post.

- In the event that the U.S. EPA command post is no longer in a safe zone, meet: River City Landscape trailer.

12.0 CONFINED SPACE

A confined space is defined as a space or work area not designed or intended for normal human occupancy, having limited means of access and poor natural ventilation, and or any structure, including buildings or rooms which have limited means of egress. Examples include tanks, vats, and basements. Confined spaces identified at this site are listed below. If a confined space entry is conducted, it will be done in accordance with procedures presented in Attachment N/A.

Type of Confined Space	Location On-Site	Comments

None anticipated.

ATTACHMENT A

SITE SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT #___:_____

SITE NAME: _____ _____

DATE: _____ _____

TYPE OF AMENDMENT: _____

REASON FOR AMENDMENT: _____

_____ _____

_____ _____

_____ _____

ALTERNATE SAFEGUARD PROCEDURES: _____

_____ _____

_____ _____

_____ _____

_____ _____

REQUIRED CHANGES IN PPE: _____

_____ _____

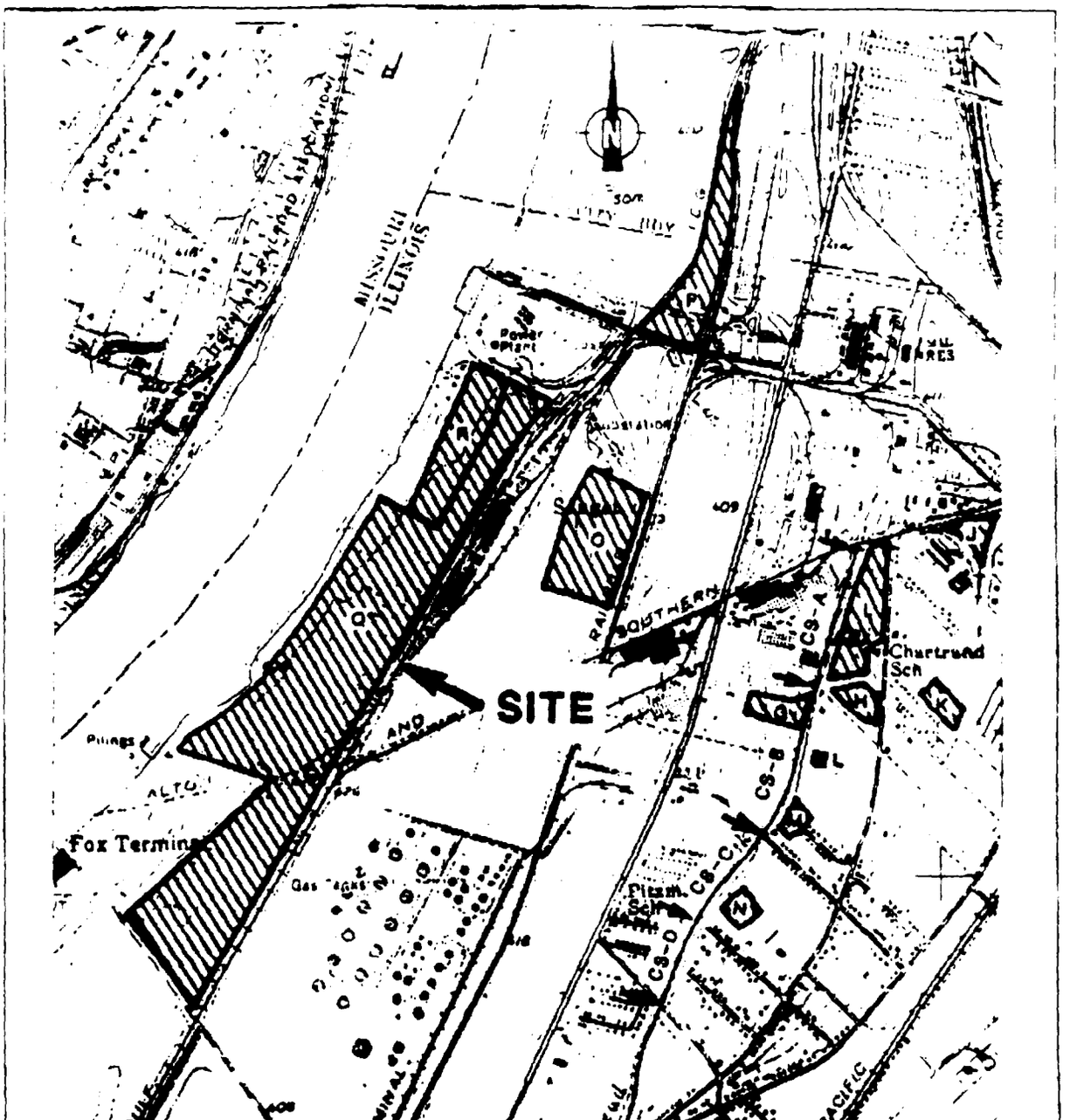
_____ _____

_____ _____

ERCS Response Manager	(Date)	ERCS Safety Manager	(Date)
E & E Lead TAT Member	(Date)	E & E RSO	(Date)
U.S. EPA OSC	(Date)		

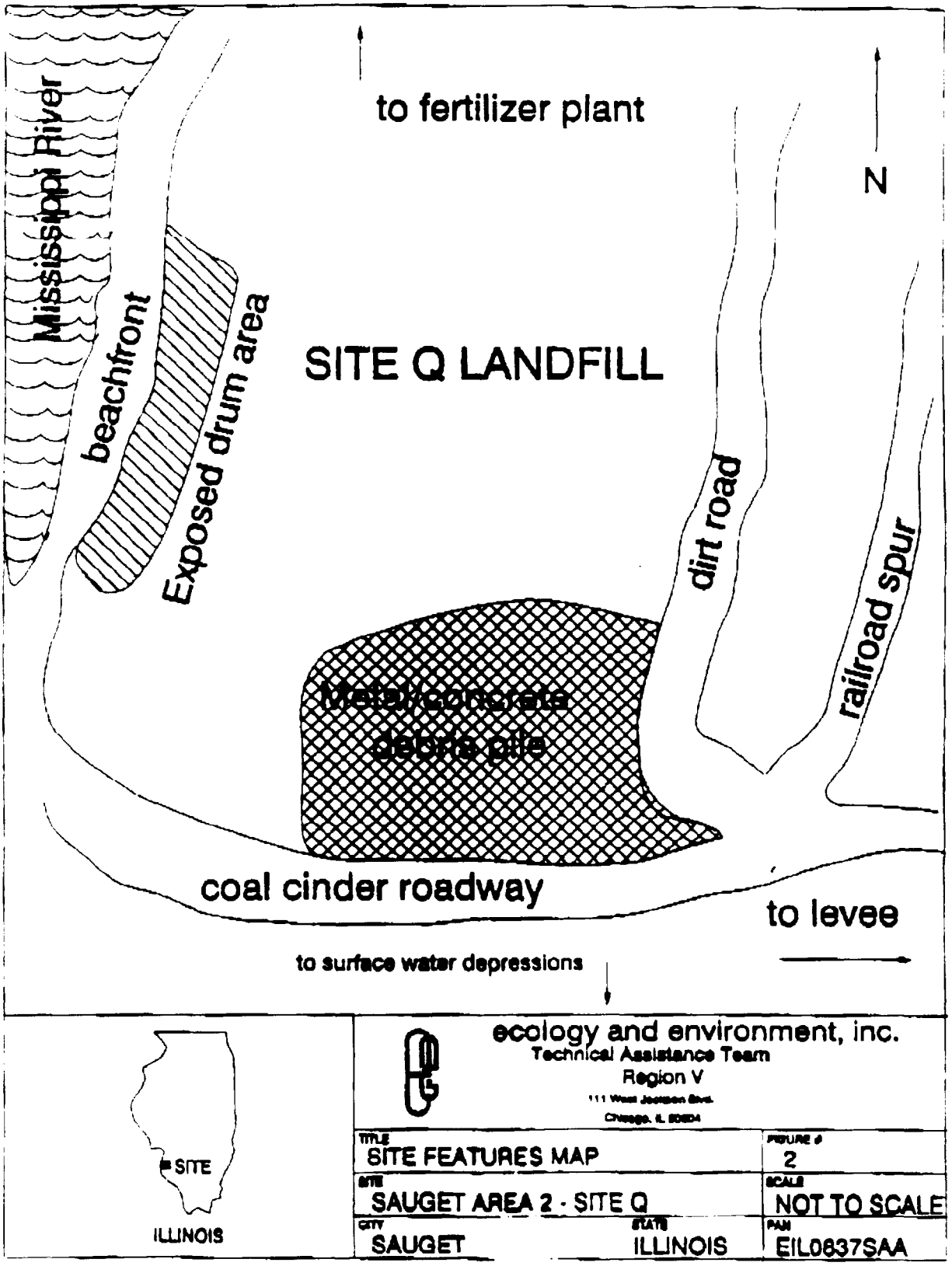
ATTACHMENT B

SITE MAPS



ecology and environment, inc.
Technical Assistance Team
Region V

TITLE: SITE LOCATION MAP	FIGURE #: 1
SITE: SAUGET AREA 2 - SITE Q	SCALE: 1" = 2000'
CITY: SAUGET STATE: ILLINOIS	FILE: EIL0837SAA


to fertilizer plant
N
Mississippi River
beachfront
Exposed drum area
SITE Q LANDFILL
dirt road
railroad spur
Metal/concrete debris pile
coal cinder roadway
to levee
to surface water depressions
SITE
ILLINOIS
ecology and environment, inc.
Technical Assistance Team
Region V
111 West Jackson Blvd.
Chicago, IL 60604
TITLE
SITE FEATURES MAP
FIGURE #
2
SITE
SAUGET AREA 2 - SITE Q
SCALE
NOT TO SCALE
CITY
SAUGET
STATE
ILLINOIS
PAN
EIL0637SAA

ATTACHMENT C

CHEMICAL HAZARD INFORMATION

Hazard (liquid): By ingestion and inhalation; skin irritant.
See also polymer, stereospecific.

polybutene. See polybutylene.

polybutylene. (polybutene; polyisobutylene; polyisobutene). Any of several thermoplastic isotactic (stereo-regular) polymers of isobutene of varying molecular weight, also polymers of butene-1 and butene-2. Butyl rubber is a type of polyisobutene to which has been added 2% of isoprene, which provides sulfur linkage sites for vulcanization. Isobutene can be homopolymerized to various degrees in chains containing from 10 to 1000 units, the viscosity increasing with molecular weight. Combustible.
See also "Vistanex."
Use: Lubricating-oil additive, hot-melt adhesives, sealing tapes, special sealants, cable insulation, polymer modifier, viscosity index improvers, films and coatings.

[illegible]tylene terephthalate. An engineering plastic derived from 1,4-butanediol, it is a thermoplastic polyester with a broad spectrum of uses.

[illegible]rbafil. TM for a glass fiber-reinforced polycarbonate.

[illegible]rbonate. $(COOC_6H_4C(CH_3)_2C_6H_4O)_n$. A synthetic thermoplastic resin derived from bisphenol A and phosgene, a linear polyester of carbonic acid. Can be formed from any dihydroxy compound and any carbonate diester by ester interchange. Polycarbonate may be in latex emulsion or in nonaqueous solution.
Properties: Transparent (90% light transmission), impervious, weather and ozone-resistant, [illegible], stain-resistant. [illegible]ring, low water absorption, high-impact strength, heat-resistant, high dielectric [illegible] dimensionally stable; soluble in chlorinated hydrocarbons and attacked by strong [illegible] aromatic hydrocarbons, [illegible] soluble in aliphatic alcohols. [illegible] molding methods, extrusion, [illegible] easily fabricated by all [illegible] thermoforming and fluidized [illegible]
Use: Molded products, [illegible] cams, structural parts, [illegible] electric devices, meter [illegible] windows, street-light [illegible]

[illegible]rboxylic acid. An organic acid containing [illegible] or more carboxyl (COOH) groups.

[illegible]er. General name for synthetic aliphatic [illegible] hydrocarbons.

[illegible]. Pesticides.

polychlorinated biphenyl. (PCB).
CAS: 1336-36-3. One of several aromatic compounds containing two benzene nuclei with two or more substituent chlorine atoms. They are colorless liquids with d 1.4–1.5. Because of their persistance, toxicity, and ecological damage via water pollution their manufacture was discontinued in the US in 1976.
Hazard: Highly toxic.

polychloroprene. See neoprene.

polychlorotrifluoroethylene. (PCTFE). See chlorotrifluoroethylene polymer.

"Polyols." TM for (1) an elastic, ruddy, gellike [illegible] resulting from the polymerization of castor oil; used in rubber compounding, fiber tile manufacture, and as a polymeric plasticizer; (2) a series of polyols used in the preparation and curing of urethane polymers for protective coatings, [illegible] insulation, and elastomers.

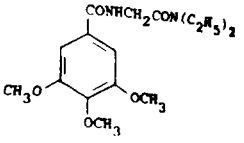
"Polyox." TM for a series of [illegible] polymers in the form of water-[illegible]

9534. Tricarballylic Acid. *1,2,3-Propa... acid;* β-carboxyglutaric acid. $C_6H_8O_6$; mol ... 40.92%, H 4.58%, O 54.51%. $HOOCCH_2CH(...)COOH$. The calcium salt is found in maple ... ie walls of evaporators in beet sugar ... ydrolysis of ethyl propane-1,1,2,3-tetr... Clarke, Murray, *Org. Syn.* coll. vol. I (2nd ed. ... from aconitic acid by reduction with sodium ... tig, *Ann.* **314**, 15 (1901); by hydrolysis of 1-cy... bomethoxypropane, obtained by reaction of ... nate with HCN in the presence of KCN: Bevley, ... pat. **2,992,268** (1958 to Pfizer).

Large, orthorhombic prisms from water or ethe... K_1 at 30° = 3.25 × 10^{-4}; K_2 = 2.65 × 10^{-5}. ... 10^{-6}. At 18° 50 g dissolve in 100 ml water ... solve in 100 ml ether. Quite sol in alc. A... trum: Bielecki, Henri, *Ber.* **46**, 2596 (1913). ... salt is neutral to litmus.

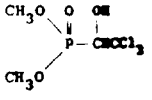
Trimethyl ester, $C_9H_{14}O_6$, d_4^{20} 1.1822; bp_{13} 150°. ...

9535. Tricetamide. *N-[2-(Diethylamino)-2... 3,4,5-trimethoxybenzamide; N-(diethylcar... 3,4,5-trimethoxybenzamide;* 3,4,5-trimethoxy... *N,N*-diethylacetamide; *N*-(3,4,5-trimethoxyt... diethylamide; Riker 548; Trimeglamide. $C_{...}$ wt 324.37. C 59.24%, H 7.46%, N 8.64%, O ... from *N*-(3,4,5-trimethoxybenzoyl)glycyl chlorid... ylamine: Kuehne, Lambert, *J. Am. Chem. So...* (1959); from *N*-(3,4,5-trimethoxybenzoyl)gly... nitrous acid and diethylamine: Kusserow, Dr... **2,956,081** (1960 to Riker).



Crystals from water, mp 133-134°.
THERAP CAT: Sedative.

9536. Trichlorfon. *(2,2,2-Trichloro-1-h... phonic acid dimethyl ester; O,O-dimeth... -trichloroethylphosphonate; O,O-dimeth... oro-1-hydroxyethylphosphonate;* chloro... trichlorphene; Bayer L 13/59; Vermicide ... bot Equine; Danex; Dipterex; Neguvon; D... Dylox; Bilarcil; Tugon; Proxol; Foschlor. C... wt 257.45. C 18.66%, H 3.13%, Cl 41.32%, ... 12.03%. Prepd by reaction of chloral with ... phite: Lorenz, U.S. pat. **2,701,225** (1955 to ... *et al., J. Am. Chem. Soc.* **76**, 4186 (1954); ... **77**, 2554 (1955). Activity: R. L. Metcalf *et al.*, ... *Entomol.* **52**, 44 (1959). Identification of ... Lange, *Z. Chem.* **20**, 446 (1980).

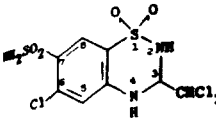


White crystals, mp 83-84°. d_4^{20} 1.73. ... press at 20°: 7.8 × 10^{-6} mm Hg. Sol... g/100 ml; chloroform 75 g/100 ml; ... benzene 15.2 g/100 ml. Very ... hexane. Dec by alkali. LD_{50} ... 630, 560 mg/kg, T. B. Gaines, *Toxicol. Appl. ...* 515 (1969).

Note: Neguvon A contains trichlorfon ... gredient, coumaphos, *q.v.*

USE: Insecticide for the control of ... anthelmintic compositions for ... U.S. pat. **3,111,457** (1963 to Am. ... A cholinesterase inhibitor.
THERAP CAT (VET): Anthelmintic. ... worms.

...chlormethiazide. *6-Chloro-3-(dichlorometh... -2H-1,2,4-benzothiadiazine-7-sulfonamide* ... 6-chloro-3-dichloromethyl-7-sulfamyl-3,4-di... -benzothiadiazine 1,1-dioxide; 3-dichlorometh... -7-sulfamyl-3,4-dihydro-1,2,4-benzothiadiazine ... 1-dichloromethylhydrochlorothiazide; hydro... ide; trichloromethiazide; Achletin; Anatran; Aponorin; Carvacron; Diurese; Triclordiuride; Esmol; Flutra; Fluitran; Intromene; Kubacron; Tachionin; Tolcasone; Triflumen; Gangesol; $C_8H_8Cl_3N_3O_4S_2$; mol wt 380.67. C 25.24%, H 2.12%, N 11.04%, O 16.81%, S 16.85%. Prepn: ... *et al., Experientia* **16**, 113 (1960); Sherlock *et al.*, ... *et al., Experientia* **16**, 113 (1960); Sherlock *et al.*, ... E. I. Goldenthal, *Toxicol. Appl. Phar...* (1971).



... from methanol + acetone + water, dec 266-... ...ed as 248-250°. Soly (mg/ml) at 25°: water ... 21; methanol 60. LD_{50} orally in rats: > 20,000 ...

USE: Diuretic, antihypertensive.

...chloroacetaldehyde. Chloral; anhydr chloral. ... wt 147.40. C 16.30%, H 0.68%, Cl 72.16%, O ... CCl_3CHO. Made by chlorinating alcohol, treating ... and then distilling: Liebig, *Ann.* **1**, 189 (1832); ... *J. Pharm. Chim.* [4] **10**, 350 (1869); **11**, 205 ... *Bull. Soc. Chim. France* [3] **17**, 228 (1897); ... [7] **18**, 332 (1897); Trillat, *Bull. Soc. Chim.* ... **17**, 230 (1897); Besson, Ger. pat. **133,021** (1902); ... 1942, II, 553; Ohse, Ger. pat. **734,723** (1943); ... (1944). Prepn by chlorination of a mixture of ... aldehyde: Société d'Electrochimie, Fr. pat. ... *Chimie et Industrie* **21**, 567 (1929). Prepn from ... by azeotropic distn: Mahoney, Pierson, U.S. ... (1952 to Merck & Co.). From hypochlorous ... ethylene: Stevens *et al.*, U.S. pat. **2,759,...** (Columbian-Southern). In the laboratory anhydr ... be quickly obtained by shaking pharmaceutical ... hydrate with concd H_2SO_4, separating the two ... drying: *cf.* Gattermann, Wieland, *Praxis des ...* (de Gruyter, Berlin, 40th ed., 1961)

... Chloral Hydrate.

... Pungent, irritating odor; d_4^{20} 1.510; d_4^{25} 1.5050. ... bp_{20} 97.5°. n_D^{20} 1.45572; $n_D^{22.4}$ 1.45412. Freely ... forming chloral hydrate. Sol in alcohol forming ... sol in ether. Polymerizes under the influ... presence of sulfuric acid forming a white ... *metachloral.*

... substance may be habit forming and is list... ... Code of Federal Regulations, Title 21 Part ...

... chloral hydrate, DDT.

...ichloroacetic Acid. TCA. $C_2HCl_3O_2$; mol wt ... H 0.62%, Cl 65.10%, O 19.58%. $CCl_3...$ ... by oxidation of chloral hydrate with nitric ... Hoagland, *Chem. & Ind. (London)* 1954, ... chlorination of acetic acid: Eaker, U.S. pat. ... to Monsanto).

... crystals; slight characteristic odor. d_4^{61} ... ...ts by 196-197°. Sol in 0.1 part water; very ... ...ion due by heating with caustic alkalies into ... chloride carbonate. Its aq soln is very acid. ... aq soln 1.2. *Keep tightly closed in a cool ...* ... trichloroacetic acid solns in water of less ... are recommended. Decompn products ... hydrochloric acid, carbon dioxide and car... LD_{50} orally in rats: 5000 mg/kg, G. W. ... *Rev.* **10**, 97 (1965).

... ethyl trichloroacetate. Clear liq; ... d_4^{20} 1.383, bp 168°. n_D^{20} 1.4507. ... with alcohol, ether.

Sodium salt, $C_2Cl_3NaO_2$, *sodium trichloroacetate, Konesta, Varitox.* Yellow deliquesc powder, mp > 300°. Soly in water at 25°: 1.2 kg/l. Sol in ethanol.

Caution: Very corrosive! When sufficient penetration has occurred, the parts should be irrigated with sodium carbonate soln.

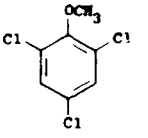
USE: As a decalcifier and fixative in microscopy; also as a precipitant of protein. As herbicide.
THERAP CAT: Caustic.
THERAP CAT (VET): Caustic, vesicant.

9540. Trichloroacetonitrile. Trichloromethylnitrile; Tritox. C_2Cl_3N; mol wt 144.40. C 16.63%, Cl 73.66%, N 9.70%. CCl_3CN. Prepared from ethyl trichloroacetate and aq ammonia: Davies, Jenkin, *J. Chem. Soc.* **1954**, 2374; by action of phosphorus pentoxide on trichloroacetamide: Carpenter, *J. Org. Chem.* **27**, 2085 (1962). Manuf by reaction of methylnitrile, HCl and chlorine gas: Käbisch, U.S. pat. **2,745,868** (1956 to Degussa). Physical and thermodynamic properties: Davies, Jenkin, *loc. cit.*

Liquid, bp_{760} 85.7°; d_4^{25} 1.4403, d_4^{35} 1.4223; $n_D^{20.0}$ 1.4409, $n_D^{27.0}$ 1.4375. LD_{50} orally in rats: 0.25 g/kg, H. F. Smyth *et al., Am. Ind. Hyg. Assoc. J.* **23**, 95 (1962).

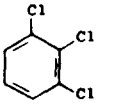
USE: Insecticide. *Caution:* A strong irritant to eyes, skin.

9541. 2,4,6-Trichloroanisole. Tyrene. $C_7H_5Cl_3O$; mol wt 211.49. C 39.75%, H 2.38%, Cl 50.30%, O 7.57%. Prepd by reaction of 2,4,6-trichlorophenol with dimethyl sulfate: Kohn, Heller, *Monatsh.* **46**, 91 (1925).



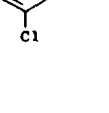
Monoclinic needles from alc, mp 60°, $bp_{738.2}$ 240°, bp_{28} 132°. Faint odor similar to that of acetophenone. Sublimes slowly at room temp. Volatile with steam. Practically insol in water. Sol in methanol, dioxane, benzene, cyclohexanone.
USE: Formerly as a dye assistant for polyester fibers.

9542. 1,2,3-Trichlorobenzene. *vic*-Trichlorobenzene. $C_6H_3Cl_3$; mol 181.46. C 39.71%, H 1.67%, Cl 58.62%. Prepared from 3,4,5-trichloroaniline by diazotization: Cohen, Hartley, *J. Chem. Soc.* **87**, 1365 (1905); Holleman, *Rec. Trav. Chim.* **37**, 196 (1918); from 2,3,4-trichloroaniline by diazotization: Dadien *et al., Monatsh.* **61**, 431 (1932); from 2,3,4-trichloroaniline by treatment with ethyl nitrite: Beilstein, Kurbatow, *Ann.* **192**, 234 (1878).



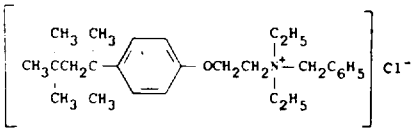
Platelets from alc, d 1.69. mp 52.6°. bp 221°. n_D^{19} 1.5776. Flash pt 113° (235.4°F). Volatile with steam. Insol in water. Sparingly sol in alc. Freely sol in benzene, carbon disulfide.
USE: A commercial grade (mixture of isomeric trichlorobenzenes) is used to combat termites. *Caution:* Irritating to eyes, mucous membranes.

9543. 1,2,4-Trichlorobenzene. *unsym*-Trichlorobenzene. $C_6H_3Cl_3$; mol wt 181.46. C 39.71%, H 1.67%, Cl 58.62%. Prepd from 2,4-dichloroaniline or 2,5-dichloroaniline or 3,4-dichloroaniline by diazotization and treatment with Cu_2Cl_2: Beilstein, Kurbatow, *Ann.* **192**, 230 (1878); van der Lande, *Rec. Trav. Chim.* **51**, 104, 110 (1932); from 1,3-diaminobenzene by tetrazotization and treatment with Cu_2Cl_2: Cohn, Fischer, *Monatsh.* **21**, 278 (1900).



THERAP CAT: Antipyretic, analgesic.

7205. Phenoctide. ***N,N-Diethyl-N-[2-[4-(1,1,3,3-tetramethylbutyl)phenoxy]ethyl]benzenemethanaminium chloride; benzyldiethyl-2-[(p-1,1,3,3-tetramethylbutyl)phenoxy]ethylammonium chloride;*** *β-p-tert*-octylphenoxyethyldiethylbenzylammonium chloride; Octaphen. $C_{27}H_{42}ClNO$; mol wt 432.11. C 75.05%, H 9.80%, Cl 8.21%, N 3.24%, O 3.70%. Prepn: Goldberg, Besly, Brit. pat. **703,477** (1954 to Ward Blenkinsop); Erekaev, *C.A.* **54,** 12483i (1960).

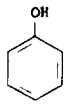


Crystals from ethyl acetate. mp 112-114° (Goldberg, Besly); mp 95° (Erekaev).

USE: Orthophosphate as lubricant: Semmens, Summers-Smith, Brit. pat. **790,056** (1958 to I.C.I.).

THERAP CAT: Topical anti-infective.

7206. Phenol. Carbolic acid; phenic acid; phenylic acid; phenyl hydroxide; hydroxybenzene; oxybenzene. C_6H_6O; mol wt 94.11. C 76.57%, H 6.43%, O 17.00%. Obtained from coal tar, or made by fusing sodium benzenesulfonate with NaOH, or by heating monochlorobenzene with aq NaOH under high pressure. The crystalline article of commerce contains at least 98% phenol. Review of mfg processes: A. Dierichs, R. Kubicka, *Phenole und Basen, Vorkommen und Gewinnung* (Akademie-Verlag, Berlin, 1958) 472 pp; Faith, Keyes & Clark's *Industrial Chemicals,* F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) pp 612-623. Use in treatment of spasticity: D. E. Garland *et al., Clin. Orthop.* **165,** 217 (1982); *eidem, Arch. Phys. Med. Rehab.* **65,** 243 (1984). Review of use in pain relief: K. M. Wood, *Pain* **5,** 205-229 (1978). Review of toxicology: H. Babich, D. L. Davis, *Regul. Toxicol. Pharmacol.* **1,** 90-109 (1981). Toxicity: W. B. Deichmann, S. Witherup, *J. Pharmacol. Exp. Ther.* **80,** 233 (1944). *Review:* C. Thurman in Kirk-Othmer *Encyclopedia of Chemical Technology* vol. 17 (Wiley-Interscience, New York, 3rd ed., 1982) pp 373-384.



Colorless, acicular crystals or white, crystalline mass; characteristic odor. *Poisonous and caustic!* Prone to redden on exposure to air and light, hastened by presence of alkalinity. d 1.071. When free from water and cresols it congeals at 41° and melts at 43°. Ultrapure material mp 40.85°. The commercial product contains an impurity which raises the mp. bp 182°. Flash pt, closed cup: 175°F (79°C). n_D^{41} 1.5425. pKa at 25° = 10.0. pH of aq solns about 6.0. It is liquefied by mixing with about 8% water. One gram dissolves in about 15 ml water, 12 ml benzene; very sol in alcohol, chloroform, ether, glycerol, carbon disulfide, petrolatum, volatile and fixed oils, aq alkali hydroxides. Almost insol in petr ether. LD_{50} orally in rats: 530 mg/kg (Deichmann, Witherup). *Keep well closed and protected from light. Do not handle with bare hands.*

Incompat. Phenol coagulates collodion; liquefies or becomes semiliquid when triturated with acetanilide, butylchloral hydrate, camphor, monobromated camphor, chloral hydrate, diuretin, lead acetate, menthol, naphthalene, naphthol, acetophenetidin, pyrogallol, resorcinol, salol, sodium phosphate, thymol, urethane, chloralamide, terpin hydrate.

Ammonium salt, C_6H_9NO, *ammonium phenate, ammonium carbolate.* White to pink cryst masses. Sol in water.

Sodium salt, C_6H_5NaO, *phenolate sodium.*

Aqueous solution with phenolate sodium, *Chloraseptic.*

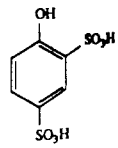
Human Toxicity: Ingestion of even small amounts may cause nausea, vomiting, circulatory collapse, tachypnea, paralysis, convulsions, coma, [illegible] urine, necrosis of mouth and G.I. [illegible] respiratory failure, sometimes from [illegible] fatal dose is 15 g but death from as [illegible] been reported. Fatal poisoning [illegible] absorption following application to [illegible] poisoning with renal and hepatic [illegible] industrial contact. *See* C. J. Polson, R. [illegible] *cal Toxicology* (Lippincott, Philadelphia, [illegible] Deichmann, Keplinger in Patty's [illegible] *Toxicology* vol. 2A, G. D. Clayton, F. E. [illegible] ley-Interscience, New York, 3rd ed., [illegible]

USE: As a general disinfectant, either [illegible] slaked lime, etc., for toilets, stables, [illegible] etc.; for the manuf of colorless or [illegible] resins, many medical and industrial [illegible] dyes; as a reagent in chemical analysis [illegible] (preservative).

THERAP CAT: Aqueous soln as topical [illegible] antiseptic; topical antipruritic.

THERAP CAT (VET): Antiseptic caustic. [illegible] pruritic skin conditions. Has been used [illegible] ternally as an antiseptic.

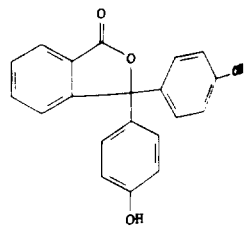
7207. Phenoldisulfonic Acid. ***4-Hydroxybenzenesulfonic acid; 4-hydroxy-m-benzenedisulfonic acid;*** phenol-2,4-disulfonic acid. $C_6H_6O_8S_2$; mol wt [illegible] 28.34%, H 2.38%, O 44.05%, S 25.22%. [illegible] by hydrolysis of the dichloride which is [illegible] tion of chlorosulfonic acid on phenol at [illegible] *et al., Monatsh.* **46,** 395 (1925). Monograph: *Sulfonation and Related Reactions* (Interscience, 1965) 529 pp.



Deliquescent needles, vague melting range [illegible] 100°. Decomp above 100°. Freely sol in water. Practically insol in ether, petr ether.

USE: In the manuf of aminophenoldisulfonic acids [illegible] are intermediates in the dye industry.

7208. Phenolphthalein. ***3,3-Bis(4-hydroxyphenyl)-(3H)-isobenzofuranone;*** 3,3-bis(*p*-hydroxyphenyl)-α-(*p*-hydroxyphenyl)-α-(4-oxo-2,5-cyclohexadiene)-*o*-toluic acid; Chocolax; Darmol; Laxophen; mol wt 318.31. C 75.46%, H 4.43%, O 20.11%. Made by condensing phenol with phthalic anhydride [illegible] **202,** 69 (1880); Herzog, *Chem. Ztg.* **51,** 84 (1927); **U.S. pat. 2,192,485** (1940 to Ex Lax); **2,522,939** (1950 to Monsanto).



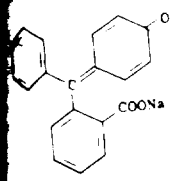
Minute, triclinic crystals, often twinned, mp [illegible] 1.299. Color: White or yellowish-white. [illegible] Phenolphthalein. Almost insoluble in water. [illegible] solves in 12 ml alcohol, in about 100 ml ether. [illegible] sol in chloroform.

USE: A 1% alcoholic soln as an indicator in [illegible] mineral and organic acids and most alkalies [illegible] for ammonia. Very sensitive to CO_2; and in [illegible] bonates the liq must be boiled. Borax can be [illegible]

...tor only when glycerol is pres- ...ally fades away as the acid is ... alkaloids. Colorless to pH 8.5; ...H 9.

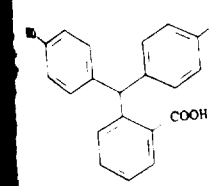
...been used as a laxative.

...Sodium. *3,3-Bis(4-hydroxyphenyl)-disodium salt.* $C_{20}H_{12}Na_2O_4$; ... H 3.34%, Na 12.70%, O 17.67%. ... soln of 1 mol phenolphthalein by ...aOH. Structure: Buu-Hoi, *Bull.* ...941).



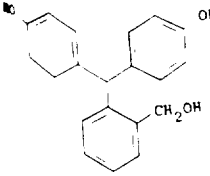
...lar mass with coppery luster, or pale ... Soluble in water, giving a deep-red ... 550-555 nm. The unstable enol ... the trisodium salt.

... *2-[Bis(4-hydroxyphenyl)methyl]-...* phenolphthalein; phthalin; 4',4''-...thane-2-carboxylic acid. $C_{20}H_{16}O_4$; ...4.99%, H 5.04%, O 19.98%. Made by ...ein with zinc dust in alkaline soln. ...reagent" when in soln. Prepd by dis- ...halin + 20 g KOH in a desired amt of ... and diluting with an equal vol of 95% ... directions for prepn of test soln and its ... *Chim. Belge* **54,** 186-202 (1945), *C.A.*



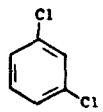
... mp 237°. Insol in water; sol in alcohol, ... The alkaline solns gradually become pink ... or other oxidizing substances. ...ent for oxidases, blood, HCN, peroxides,

...thalol. *2-[Bis(4-hydroxyphenyl)methyl]-...-[bis(p-hydroxyphenyl)methyl]benzyl al-...* 2-(4,4'-di-...phenylmethenylbenzyl alcohol; 2-(4,4'-di-...yl)benzyl alcohol; bis(4-hydroxyphenyl)-...phenyl)methane; Egmol; Regolax. C_{20}-... 306.34. C 78.41%, H 5.92%, O 15.67%. ...cher, *J. Am. Chem. Soc.* **74,** 5216 (1952); ... *Arch. Pharm.* **288,** 234 (1955); Bulcsu, Ger. ... (1962 to Iromedica), *C.A.* **59,** 1535b (1963).



... dil alcohol, mp 201-202°. ... $C_{20}H_{20}O_4$, crystals from benzene or chloro- ...174°. Soluble in dil NaOH. ... $C_{20}H_{24}O_6$, crystals from methanol o... ...ractically insol in dil alkali.

of chlorobenzene: **Engelsma *et al.*, *Rec. Trav. Chim.* 76,** 325 (1957). Separation of mixture contg *m*-, *o*-, and *p*-dichlorobenzenes by distillation and crystn: Mueller, Wolz, Fr. pat. **1,374,863** (1964 to **Bayer**), *C.A.* **62,** 4936e (1965), corresp to **Brit. pat. 999,845.**



Liquid, bp 173°. **mp −24.76°.** d_4^{20} 1.2884, d_4^{25} 1.2828. n_D^{20} 1.5459. Practically **insol in water;** sol in alcohol, ether.

3044. *o*-Dichlorobenzene. *1,2-Dichlorobenzene;* orthodichlorobenzene. **Empirical formula,** prepn, and separation from *m*- and *p*-**dichlorobenzenes,** *see m*-isomer above. Manuf: **Faith, Keyes & Clark's *Industrial Chemicals,*** F. A. Lowenheim, M. K. **Moran, Eds.** (Wiley-Interscience, New York, 4th ed., 1975) **pp 258-265.**

Liquid, bp 180.5°. **mp −17.03°.** d_4^{20} 1.3059, d_4^{25} 1.3003. n_D^{20} 1.5515, n_D^{25} 1.5491. **Flash pt,** closed cup: 151°F (66°C). Practically insol in **water; miscible** with alc, ether, benzene.

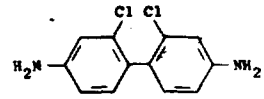
USE: Solvent for **waxes, gums,** resins, tars, rubbers, oils, asphalts; insecticide for **termites** and locust borers; fumigant; removing sulfur from **illuminating gas;** as degreasing agent for metals, leather, **wool;** as **ingredient** of metal polishes; as heat transfer medium; as **intermediate** in the manuf of dyes. *Caution:* Can cause injury to liver, kidneys. High concns cause CNS depression.

3045. *p*-Dichlorobenzene. **Paracide;** PDB; Paradichlorobenzene; Para-zene; **Di-chloricide; Paramoth.** Empirical formula, prepn, and **separation from** *m*- and *o*-dichlorobenzene, *see m*-isomer above. **Crystal** structure of triclinic form (β-modification): **Housty, Clastre,** *Acta Cryst.* **10,** 695 (1957); of monoclinic form (α-modification) and its transformation to triclinic form: **Panatoni *et al.*, *Gazz. Chim. Ital.* 93,** 813 (1963). **Manuf: Faith,** Keyes & Clark's *Industrial Chemicals,* F. A.Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New Yok, **4th ed.,** 1975) pp 258-265.

Volatile crystals **with a characteristic** penetrating odor. Sublimes at ordinary **temps. mp** 53.5° (α-modification), 54° (β-modification). **bp** 174.12°. n_D^{20} 1.5285. Flash pt (closed cup) 150°F. **Practically insol in water;** sol in alcohol, ether, benzene, chloroform, **carbon disulfide.** Non-corrosive; non-staining. LD_{50} **orally in rats: 500 mg/kg,** *Toxic Substances List,* H. E. Christensen, **Ed.** (1973) p 321.

USE: **Insecticidal fumigant. Popular** for domestic use against clothes **motha,** ***Caution:*** Vapors may cause irritation to skin, throat, and eyes. **Prolonged** exposure to high concns may show **weakness, dizziness,** loss of weight; liver injury may develop.

3046. 2,2'-Dichlorobenzidine. ***2,2'-Dichloro[1,1'-biphenyl]-4,4'-diamine:*** $C_{12}H_{10}Cl_2N_2$; mol wt 253.13. C 56.94%, H 3.98%, Cl **28.01%,** N 11.07%. Prepn from *m*-chloronitrobenzene: **Laubenheimer,** *Ber.* **8,** 1625 (1875); Cain, May, *J. Chem. Soc.* **97, 723** (1910).

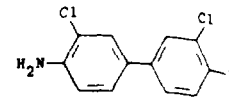


Needles from water or **prisms from alc,** mp 165°. Almost insol in water; **moderately sol in alc;** readily sol in ether.

Hydrochloride, $C_{12}H_{10}Cl_2N_2 \cdot 2HCl$, leaflets from water, moderately sol in water.

USE: **Manuf azo dyes.**

3047. 3,3'-Dichlorobenzidine. ***3,3-Dichloro-(1,1'-biphenyl)-4,4'-diamine;*** 3,3'-dichloro-4,4'-biphenyldiamine; DCB. $C_{12}H_{10}Cl_2N_2$; mol wt 253.13. C 56.94%, H 3.98%, Cl 28.01%, N 11.07%. **Prepn from** *o*-chloronitrobenzene: Cohn, *Ber.* **33,** 3552 (1900). **Review** and evaluation of studies of carcinogenicity **in laboratory animals** and in humans: *IARC Monographs* **4, 49-55 (1974).**



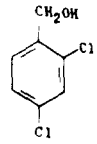
Needles from alc or benzene, mp 132-1[illegible] in water. Readily sol in alc, benzene, [illegible]

Hydrochloride, $C_{12}H_{10}Cl_2N_2 \cdot 2HCl$, [illegible] water, readily in alc.

Note: This substance may reasonably [illegible] a carcinogen: *Fourth Annual Report on* [illegible] 85-002, 1985) p 79.

USE: Manuf azo dyes; as an intermediate [illegible] Yellow pigments.

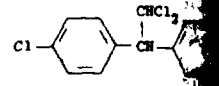
3048. Dichlorobenzyl Alcohol. 2,4-*methanol;* Dybenal. $C_7H_6Cl_2O$; mol wt [illegible] H 3.42%, Cl 40.05%, O 9.04%. Prepn: [illegible] *Trav. Chim.* **51,** 98 (1932); Metayer, Dat. *Chim. France* **1954,** 615.



Crystals, mp 59.5°.

THERAP CAT: Antiseptic.

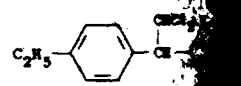
3049. 1,1-Dichloro-2,2-bis(*p*-chl[illegible] *1'-(2,2-Dichloroethylidene)bis[4-chl[illegible]*rodiphenylethane; TDE; dichloro[illegible] DDD; *p,p'*-DDD; *p,p'*-TDE; Rhoth[illegible] 320.05. C 52.54%, H 3.15%, Cl 44.[illegible] pesticide; a component of technical [illegible] condensing dichloroacetaldehyde wi[illegible] ler *et al.*, *J. Am. Chem. Soc.* **67,** 19[illegible]



Crystals, mp 109-110°. The chem[illegible] are similar to those of DDT. LD[illegible] mg/kg, T. B. Gaines, *Toxicol.* [illegible] (1969).

USE: Insecticide. *Caution:* S[illegible] *Acute toxicity symptoms:* lethargy b[illegible] mated fatal oral dose 5 g/kg bo[illegible] *symptoms:* atrophy of adrenal cor[illegible] toms similar to DDT, *q.v.*

3050. 1,1-Dichloro-2,2-bis(*p*-c[illegible] *(2,2-Dichloroethylidene)bis[4-chl[illegible]*phenyl)-1,1-dichloroethane; di[illegible] ane; Perthane; Q-137. $C_{18}H_{20}Cl_2$[illegible] H 6.56%, Cl 23.08%. Prepn: M[illegible] **2,917,553** (1955 to Rohm & Ha[illegible]



Crystals from ethanol mp 5[illegible] water; sol in acetone, kerose[illegible] persistence in the soil. LD_{50} o[illegible] T. B. Gaines, *Toxicol. Appl. Ph[illegible]*

USE: Insecticide. *Caution:* S[illegible]

3051. Dichloro(2-chlorovinyl)[illegible] ***arsonous dichloride;*** 2-chlorovin[illegible] nylarsine dichloride; Lewisite. C[illegible] C 11.59%, H 0.97%, As 36.13%[illegible] $AsCl_2$. Obtained together with [illegible] sine and tris(2-chlorovinyl)arsi[illegible]

In addition, each team member should closely adhere to the following guidelines:

- Each member should have his or her name written on the hard hat or coverall for ease of identification when respiratory protective equipment is worn;
- Extraneous conversation is forbidden;
- Standard procedures and nomenclature will be used;
  - Each transmission is begun by identifying the party being reached, followed by identification of the initiator; and
  - This is followed by a pause for acknowledgment.
  - Each word must be pronounced clearly; language should be plain and direct; and
  - Each transmission should end with "over" or 10-4.

ATTACHMENT H

WORKING AROUND HEAVY EQUIPMENT

GENERAL HEAVY EQUIPMENT OPERATIONS

GENERAL HEAVY EQUIPMENT OPERATIONS

- Organize site, set up staging area, and designate routes for equipment.
- All operators must be trained and experienced with the equipment they are operating.
- All equipment must be maintained in accordance with 29 CFR 1926 regulations.
- Equipment requiring back-up or swing alarms must have an alarm or a spotter.
- Equipment capacity must be designated and not exceeded.
- Operators must wear seat belts unless the equipment does not have roll-over protection.
- Standard hand signals should be utilized when communicating with the equipment operator.
- No unnecessary personnel should be on the equipment.

WORKING AROUND HEAVY EQUIPMENT

- No unnecessary personnel should be in the area of heavy equipment operation.
- No personnel should be within 10 feet of the equipment when it is in operation.
- Anyone approaching a piece of heavy equipment must make visual contact with the operator.
- No one except the operator should ride on heavy equipment.
- Organize site, set up staging area, and designate routes for equipment.
- Standard hand signals should be utilized when communicating with the operator.

ATTACHMENT I

EXCAVATION

FEDERAL REGISTER

PART 1926.650 (AMENDED)

PART 1926—[AMENDED]

Subpart M—[Amended]

1. By revising the authority citation for subpart M of part 1926 to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 3333; Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), or 9–83 (48 FR 35736), as applicable, and 29 CFR part 1911.

2. By revising subpart P of part 1926 to read as follows:

Subpart P—Excavations

Sec.

1926.650 Scope, application, and definitions applicable to this subpart.

1926.651 General requirements.

1926.652 Requirements for protective systems.

Appendix A to Subpart P—Soil Classification

Appendix B to Subpart P—Sloping and Benching

Appendix C to Subpart P—Timber Shoring for Trenches

Appendix D to Subpart P—Aluminum Hydraulic Shoring for Trenches

Appendix E to Subpart P—Alternatives to Timber Shoring

Appendix F to Subpart P—Selection of Protective Systems

Subpart P—Excavations

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 3333; Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), or 9–83 (48 FR 35736), as applicable, and 29 CFR part 1911.

§ 1926.650 Scope, application, and definitions applicable to this subpart.

(a) *Scope and application.* This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.

(b) *Definitions applicable to this subpart.*

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or walers.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or sides means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout means the accidental release or failure of a cross brace.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or excavated materials or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in a state which does not register professionals, is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Sheeting means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either prefabricated or job-built in accordance with § 1926.652 (c)(3) or (c)(4). Shields used in trenches are generally referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means a structure such as a mesh hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sides. See "Faces."

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp means a ramp built of steel or wood, usually used for vehicular access. Ramps made of soil or rock are not considered structural ramps.

Support system means a structure such as underpinning, bracing, or shoring, which provides support to

installation, or the sides of an excavation.

Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See "Shield."

Trench shield. See "Shield."

Uprights means the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Waler means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

§ 1926.651 *General requirements.*

(a) *Surface encumbrances.* All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

(b) *Underground installations.* (1) The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

(2) Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the acceptable means to locate utility installations are used.

(3) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.

(4) While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

(c) *Access and egress.*—(1) *Structural ramps.* (i) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

(ii) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

(iii) Structural members used for ramps and runways shall be of uniform thickness.

(iv) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

(v) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

(2) *Means of egress from trench excavations.* A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

(d) *Exposure to vehicular traffic.* Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

(e) *Exposure to falling loads.* No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with § 1926.601(b)(6), to provide adequate protection for the operator during

when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

(g) *Hazardous atmospheres.*—(1) *Testing and controls.* In addition to the requirements set forth in subparts D and E of this part (29 CFR 1926.50-1926.107) to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

(i) Where oxygen deficiency (atmosphere containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmosphere in the excavation shall be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

(ii) Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation in accordance with subparts D and E of this part respectively.

(iii) Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

(iv) When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

(2) *Emergency rescue equipment.* (i) Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

(ii) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear

attended at all times while the employee is exposed to the hazards.

(b) *Protection from hazards associated with water accumulation.* (1) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

(2) If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

(3) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with paragraphs (h)(1) and (h)(2) of this section.

(i) *Stability of adjacent structures.* (1) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

(2) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except where:

(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

(ii) The excavation is in stable rock; or

(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

(3) Sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

(j) *Protection of employees from loose rock or soil.* (1) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

(2) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

(k) *Inspections.* (1) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

(2) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

(l) *Fall protection.* (1) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

(2) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall

[1926.652 Requirements for protective systems.

(a) *Protection of employees in excavations.* (1) Each employee in an excavation shall be protected from cave-in by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:

(i) Excavations are made entirely in stable rock; or

(ii) Excavations are less than 5 feet (1.52m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

(2) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

(b) *Design of sloping and benching systems.* The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (b)(1), or, in the alternative, paragraph (b)(2), or, in the alternative, paragraph (b)(3), or, in the alternative, paragraph (b)(4), as follows:

(1) *Option (1)—Allowable configurations and slopes.* (i) Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

(ii) Slopes specified in paragraph (b)(1)(i) of this section, shall be excavated to form configurations that are in accordance with the slopes set forth for Type C soil in Appendix B to this subpart.

(2) *Option (2)—Determination of slopes and configurations using Appendices A and B.* Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B to this subpart.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and shall include all of the following:

(A) Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;

(B) Identification of the limits of use of the data, to include the maximum [illegible]

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(ii) At least one copy of the tabulated data which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include at least the following:

(A) The magnitude of the slopes that were determined to be safe for the particular project;

(B) The configurations that were determined to be safe for the particular project; and

(C) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the Secretary upon request.

(c) *Design of support systems, shield systems, and other protective systems.* Design of support systems, shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (c)(1); or, in the alternative, paragraph (c)(2); or, in the alternative, paragraph (c)(3); or, in the alternative, paragraph (c)(4) as follows:

(1) *Option (1)—Designs using appendices A, C and D.* Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in appendices A and C to this subpart. Designs for aluminum hydraulic shoring shall be in accordance with paragraph (c)(2) of this section, but if manufacturer's tabulated data cannot be utilized, designs shall be in accordance with appendix D.

(2) *Option (2)—Designs Using Manufacturer's Tabulated Data.* (i) Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications,

(ii) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.

(iii) Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the Secretary upon request.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and include all of the following:

(A) Identification of the parameters that affect the selection of a protective system drawn from such data;

(B) Identification of the limits of use of the data;

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include the following:

(A) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and

(B) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the Secretary upon request.

(d) *Maintenance and assessment.* (1) damage or defects that might impair their proper function.

(2) Manufactured materials and equipment used for protective systems shall be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.

(3) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.

(e) *Installation and removal of support.*—(1) *General.* (i) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

(ii) Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapse, or from being struck by members of the support system.

(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.

(iv) Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

(v) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

(vi) Backfilling shall progress together with the removal of support systems from excavations.

(2) *Additional requirements for support systems for trench excavations.* (i) Excavation of material to a level greater than 2 feet (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system as designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible

(ii) Installation of a support system shall be closely coordinated with the excavation of trenches.

(f) *Sloping and benching systems.* Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

(g) *Shield systems*—(1) *General.* (i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

(ii) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

(iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(2) *Additional requirement for shield systems used in trench excavations.* Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

Appendix A to Subpart P

Soil Classification

(a) *Scope and application*—(1) *Scope.* This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(2) *Application.* This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in § 1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in § 1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) *Definitions.* The definitions and examples given below are based on, in whole or in part, the following: American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System, The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt, (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Soil classification system means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

(i) The soil is fissured; or

(ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or

(iii) The soil has been previously disturbed; or

(iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or

(v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

(i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or

(ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.

(iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.

(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or

(v) Dry rock that is not stable; or

(vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C means:

(i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or

(ii) Granular soils including gravel, sand, and loamy sand; or

(iii) Submerged soil or soil from which water is freely seeping; or

(iv) Submerged rock that is not stable, or

(v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) *Requirements*—(1) *Classification of soil and rock deposits.* Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) *Basis of classification.* The classification of the deposits shall be made based on the results of at least one visual and

shall be conducted by a competent person using tests described in paragraph (d) below, or by other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials or the U.S. Department of Agriculture textural classification system.

(3) *Visual and manual analyses.* The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(4) *Layered systems.* In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) *Reclassification.* If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) *Acceptable visual and manual tests.*—(1) *Visual tests.* Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

(iii) Observe the sides of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(v) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation's sides.

(2) *Aforced tests.* Manual analyses of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(i) *Plasticity.* Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 2 mm in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

(ii) *Dry strength.* If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into smaller clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

(iii) *Thumb penetration.* The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488—"Standard Recommended Practice for Description of Soils (Visual—Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large chunk of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

(iv) *Other strength tests.* Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(v) *Drying test.* The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry.

(A) If the sample develops cracks as it dries, significant fissures are indicated.

(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as a unfissured cohesive material and the unconfined compressive strength should be determined.

(C) If a sample falls apart when dry, it is either granular material or a cohesive material with fissures. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Appendix B to Subpart P

Sloping and Benching

(a) *Scope and application.* This appendix contains specifications for sloping and benching when used as elements of protective systems required in excavations (see also). The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in .

(b) *Definitions.*

Actual slope means the slope to which an excavation face is excavated.

Cleavage means that the soil is in a condition where a cave-in is imminent or is likely to occur. Cleavage is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or bowing of material from the bottom of an excavation; the spalling of material from the face of an excavation; and raveling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and tumbling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) *Requirements.*—(1) *Soil classification.* Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

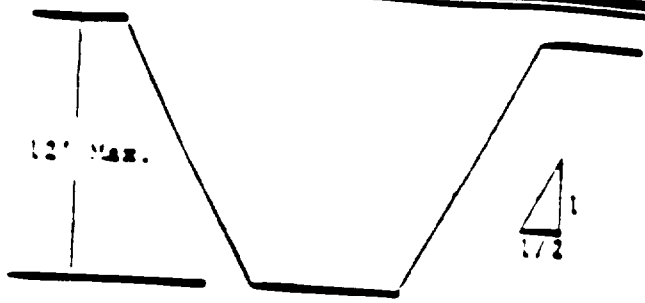
(2) *Maximum allowable slopes.* The maximum allowable slopes for a soil or rock deposit shall be determined from Table B-1 of this appendix.

(3) *Actual slope.* (i) The actual slope shall not be steeper than the maximum allowable slope.

(ii) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that occurs, the slope shall be cut back to an actual slope which is at least ½ horizontal to one vertical (½:1V) less steep than the maximum allowable slope.

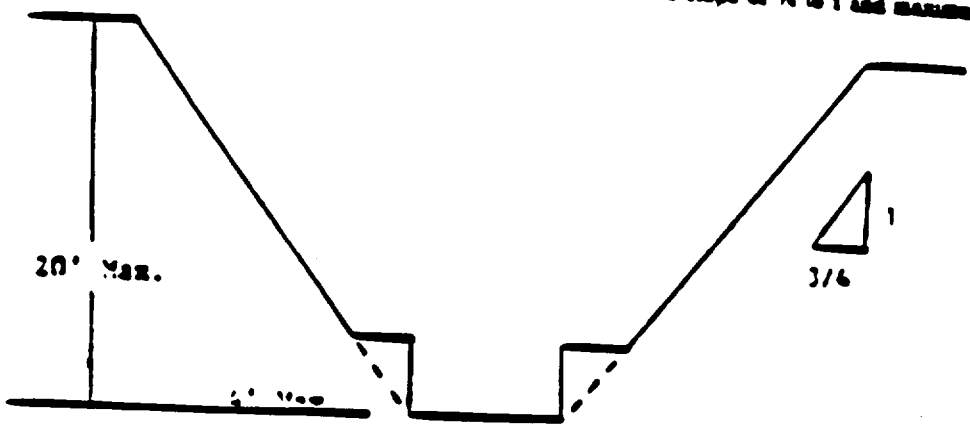
(iii) When seepage is present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall ensure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with § 1926.651(i).

(4) *Configuration.* Configurations of

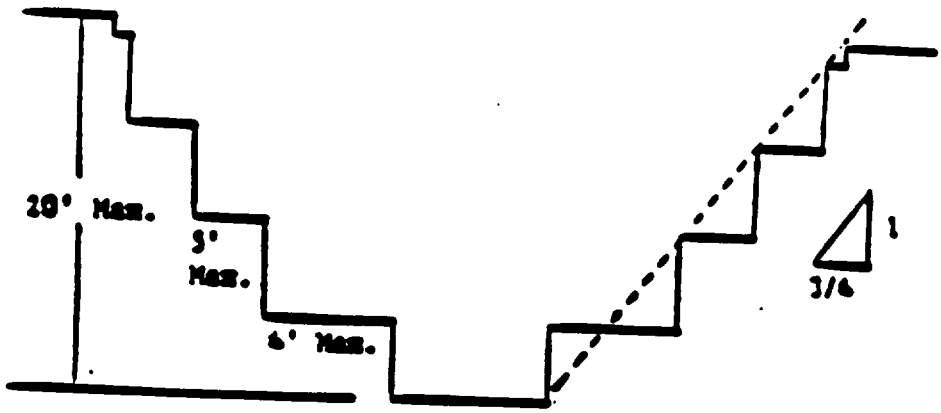


Simple Slope—Short Term

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of ¾ to 1 and maximum bench dimensions as follows:

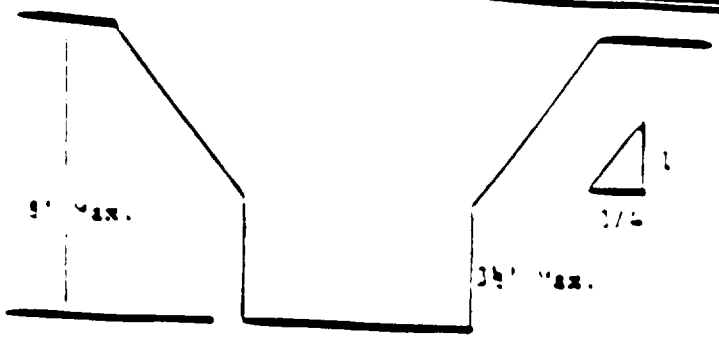


Simple Bench



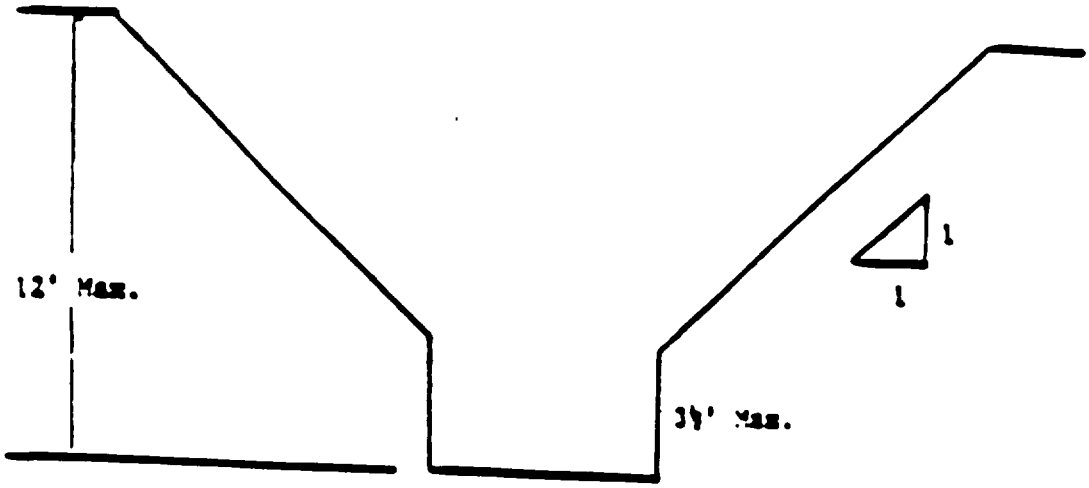
Multiple Bench

3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3½ feet.



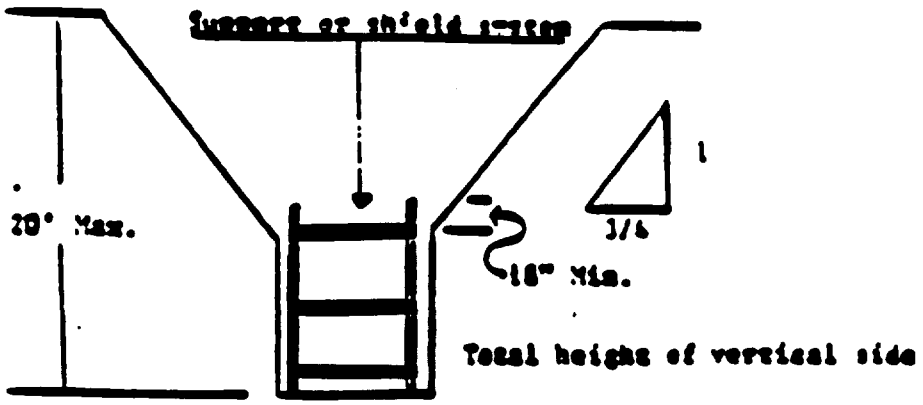
Unsupported Vertically Sided Lower Portion—Maximum 8 Feet in Depth

All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3½ feet.



Unsupported Vertically Sided Lower Portion—Maximum 12 Feet in Depth

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of ¾:1. The support or shield system must extend at least 18 inches above the top of the vertical side.



Supported or Shielded Vertically Sided Lower Portion

4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under § 1926.652(b).

B-1.2 Excavations Made in Type B Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

TABLE B-1

MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V) FOR EXCAVATIONS LESS THAN 20 FEET DEEP [1]
STABLE ROCK TYPE A [2] TYPE B TYPE C	VERTICAL (90°) 3/4 : 1 (53°) 1:1 (45°) 1½: 1 (34°)

NOTES:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of 1/2H:1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53°).
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

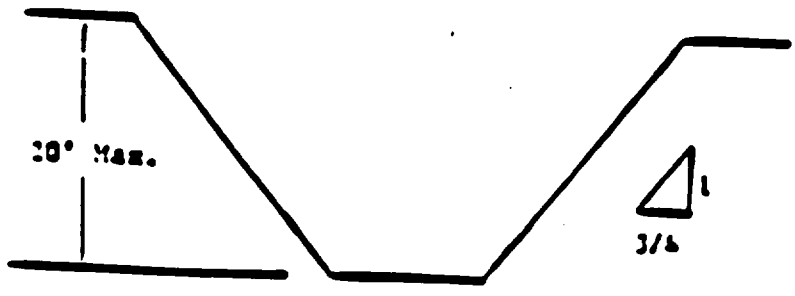
Figure B-1

Slope Configurations

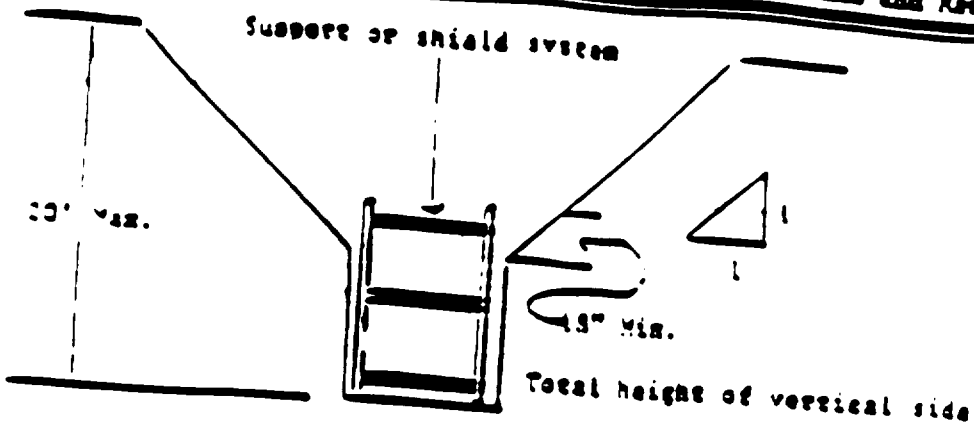
(All slopes stated below are in the horizontal to vertical ratio)

B-1.1 Excavations made in Type A soil.

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of ¾:1.



Simple Slope—General

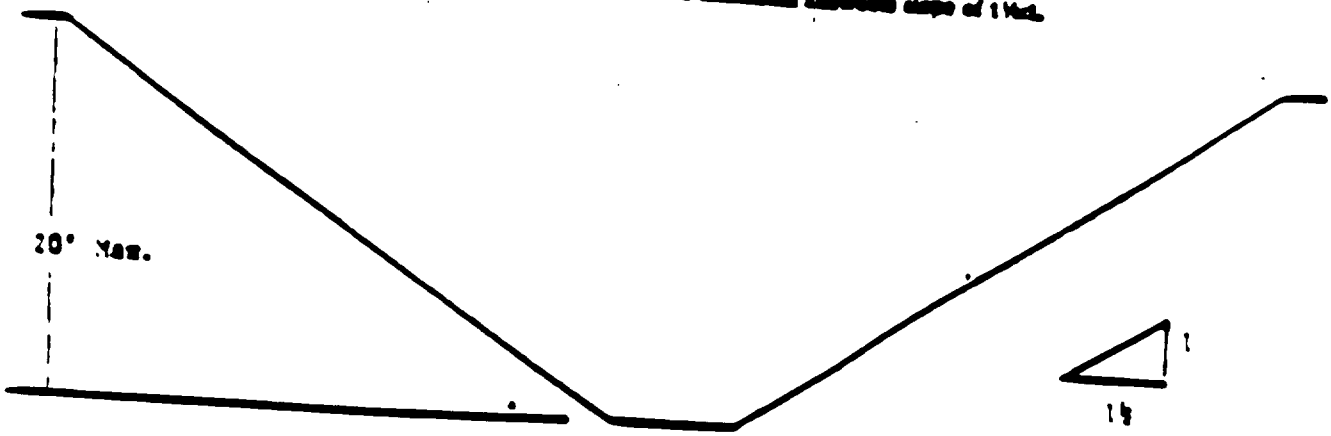


Vertically Sided Lower Portion

4. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

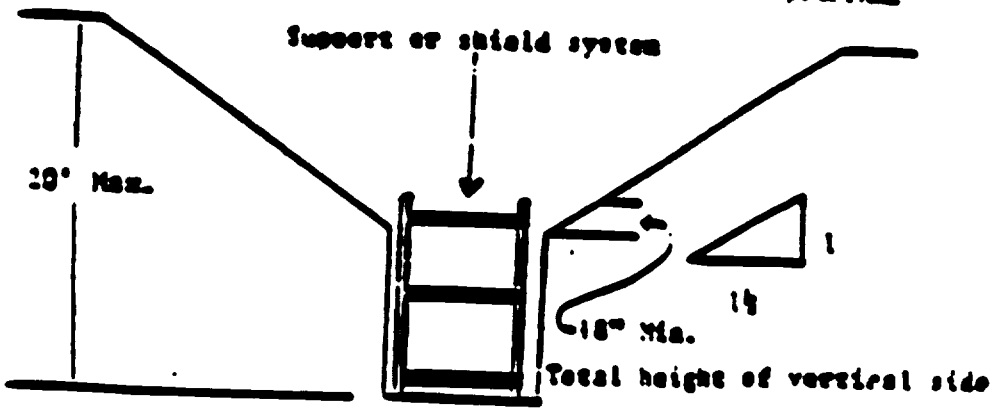
Sloped Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



Simple Slope

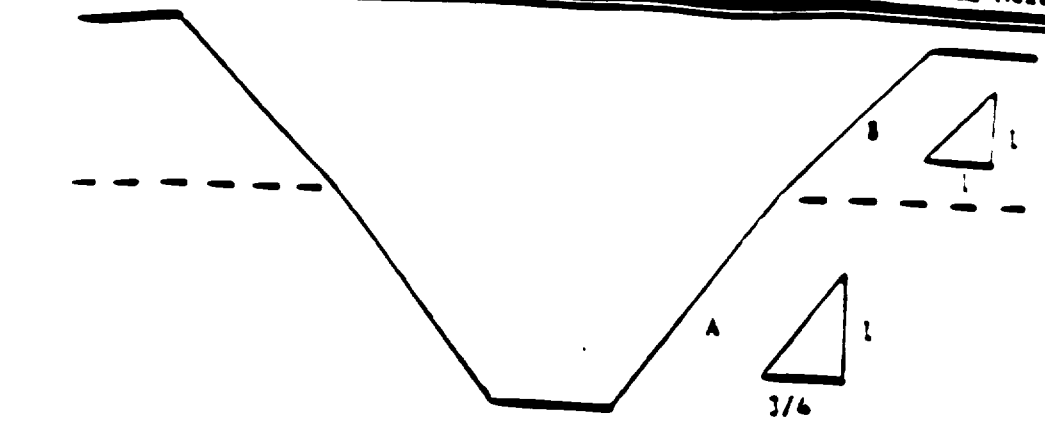
2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1½:1.



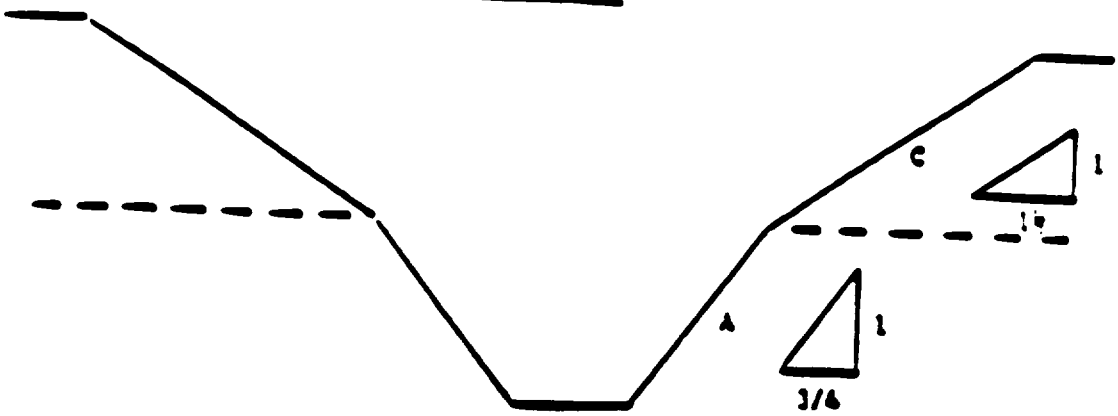
Vertical Sided Lower Portion

3. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

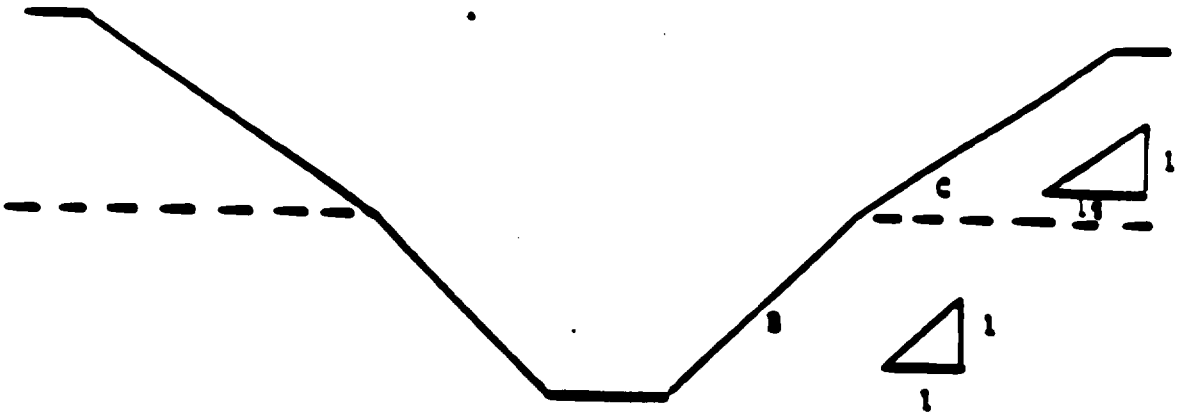
Sloped Excavations Made in Layered Soils



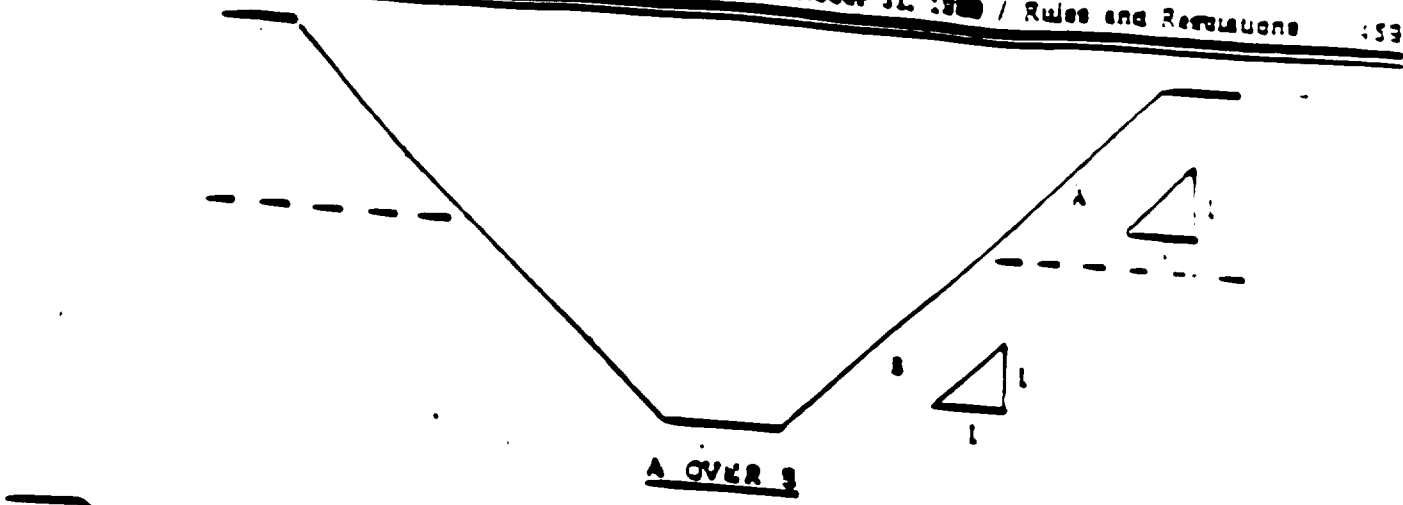
B OVER A



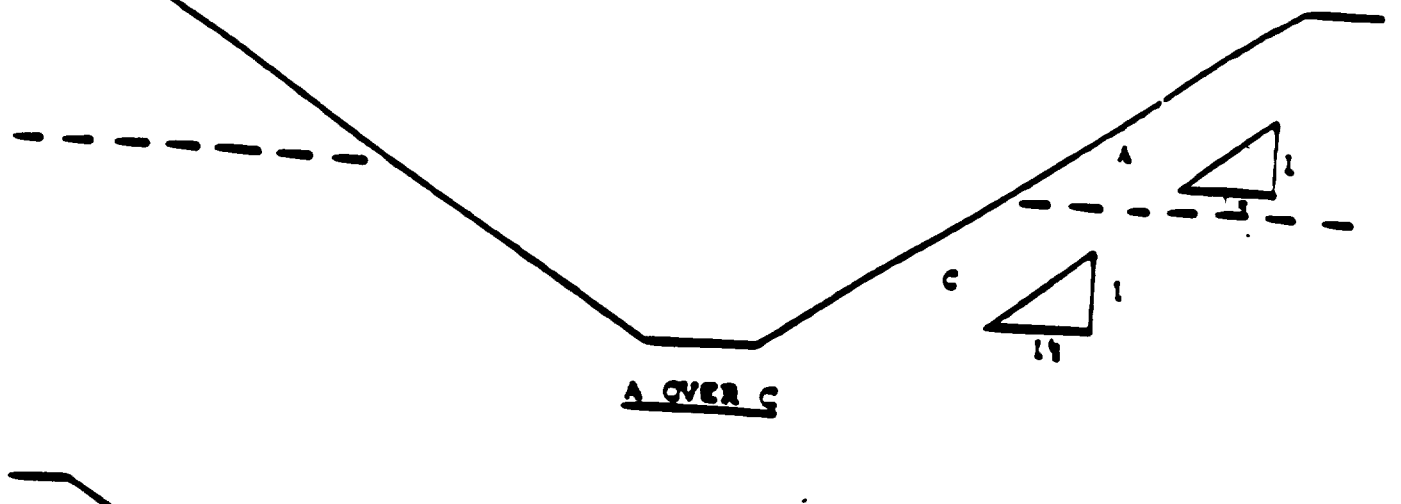
C OVER A



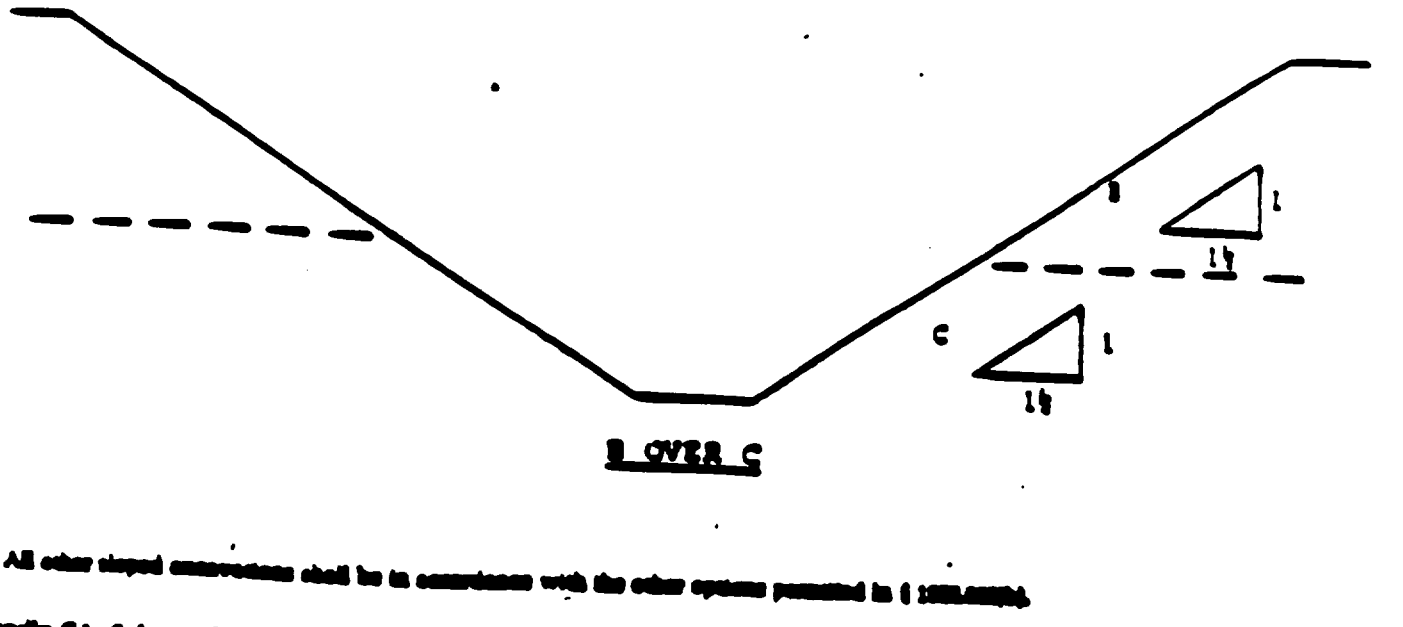
C OVER B



A OVER B



A OVER C



B OVER C

2. All other sloped excavations shall be in accordance with the other options permitted in § 1926.650(b).

Appendix C to Subpart P

Timber Shoring for Trenches

(a) *Scope.* This appendix contains information that can be used timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with § 1926.652(c)(2). Other timber shoring configurations, other systems of support such as hydraulic and pneumatic systems, and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the requirements set forth in § 1926.652(b) and § 1926.652(c).

(b) *Soil Classification.* In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil

ATTACHMENT J

TRUCK LOADING

TRUCK LOADING

- If drivers must enter the exclusion zone, they must have the proper level of HAZWOPER training.

- Personnel covering the load must have the proper level of Personal Protective Equipment. The specific level will be contaminant specific. The Health and Safety Manager should be consulted if the level of PPE is not designated in the Health and Safety Plan.

- Proper equipment must be provided to personnel for getting in and out of the truckbed for lining and covering (ladder, etc.).

- Proper equipment and experienced operators must be utilized for loading trucks.

- The load must be centered and evenly distributed on the truck.

ATTACHMENT K

SOIL SAMPLING

SOIL SAMPLING

- Proper level of Personal Protective Equipment is required. Sampling would not be conducted if a hazard did not exist. If the level of PPE is not designated in the Health and Safety Plan, the Health and Safety Manager must be consulted.

- Specific sampling protocol for the contaminant must be must be followed (grab, 95% sampling).

- Proper ergonomics should be followed when sampling—bend at the knees, not the waist.

- Prevention of cross-contamination is important when sampling; therefore, methods to prevent it should be addressed.

- Proper shipping of samples must be addressed. Consult the Transportation and Disposal Coordinator or Regulations Compliance Manager for assistance.

2.1.14 Hazards and SOPs associated with Soil Sampling:

Hazards:

1. Contact with or inhalation of contaminants, potentially in high concentrations in sampling media.
2. Back strain and muscle fatigue due to lifting, shoveling and auguring techniques.
3. Contact with or inhalation of decontamination solutions.

SOPs

1. Proper awareness of chemical contaminants and review of suspected contaminants should be completed and implementation of adequate protection program as well.
2. Proper lifting (pre-lift wight assessment, use of legs, multiple personnel) techniques will prevent back strain. Use slow easy motions when shoveling, auguring, and digging to decrease muscle strain.
3. Material Safety Data Sheets for all decon solutions should be included with each Site Health and Safety Plan.

4.9 SOIL SAMPLING

4.9.1 General

The objective of this section is to give general guidance for the collection of soil samples during Branch field investigations. Guidance for preparing soil sampling protocols, including statistical sampling methodology are included in the EPA publication "Preparation of Soil Sampling Protocol, Techniques and Strategies" (22). Specific standard soil sampling and field techniques used by Branch personnel are included as Appendix H.

4.9.2 Sampling Location/Site Selection

Areas selected for soil sampling shall be strategically located in order to collect a representative fraction of the soils with the minimum number of samples and effort. A surface inspection of the subject area shall be made to locate pertinent features (e.g., rock outcrops, drainage patterns, surface runoff, ponds, lakes, wet areas, seeps, springs, permanent structures, fill areas, erosional areas, depositional areas, etc.) and to evaluate the relationship between these features and potential sources of pollution. The location of sediment depositional areas are good indicators of surface runoff direction. If the direction of surface runoff or drainage is difficult to detect, observation of new deposition or sediment movement following a rain may prove helpful in establishing this direction. The spreading or fanning out of the sediment body will indicate direction of flow.

In most instances, the first investigation of a site will be a reconnaissance type survey. Soil sampling in these instances will generally be confined to surface or near-surface soils and/or sediments with hand equipment. For screening purposes, sampling of this type should be conducted in depositional areas on the periphery of the study area, primarily at the downstream or downgradient portion(s) of the area of interest; however, an upgradient location should also be selected for obtaining background and/or control samples. Investigators should be aware that sampling in depositional areas tends to bias the sampling toward elevated concentrations which is useful as a screening tool, but should not be construed as representative of the area conditions.

More in-depth investigations are usually conducted after a preliminary study or reconnaissance survey has been completed. Review of previous investigations will aid in selection of suitable sampling locations and these studies should be examined when the study plan for the more detailed study is prepared. The number of samples and the number of test pits and/or borings and the specific depth that samples are collected will vary according to the site conditions and the scope of the investigation.

4.9.3 Equipment Available

The following Branch equipment is available for field use in soil sampling: stainless steel spoons; stainless steel hand augers; stainless steel shovels; Shelby tubes; portable power augers (Little Beaver®); stainless steel scoops; glass pans; and drill rigs and associated equipment (i.e., split spoon samplers) which may on occasion be rented or borrowed for special projects.

4.9.4 Sampling Techniques

4.9.4.1 General — Sampling is often conducted in areas where a vegetative turf has been established. In these cases a clean stainless steel shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. When the soil sample is obtained, it should be deposited into a glass pan for mixing (or compositing, if applicable) prior to filling the sample containers. Mixing of the soil sample for chemical analysis should be performed in accordance with the procedures outlined in Section 4.6.3.3.4. If an undisturbed sample is needed, the Shelby tube sampler may be used as described in Section 4.9.4.2.

If practical, and at the project leader's discretion, all trenches or holes that were excavated for sampling should be filled in and the turf replaced.

4.9.4.2 Surface Soil Sampling — Prior to sampling, leaves, grass, and surface debris should be removed from the area to be sampled using a clean stainless steel spoon or shovel. Surface soil samples shall then be collected using a precleaned, stainless steel scoop or spoon.

4.9.4.3 Shallow Subsurface Soil Sampling — Shallow subsurface soil samples may be collected by digging a hole or trench with a stainless steel shovel, then removing all of the loose soil and collecting a sample at the desired depth using a stainless steel spoon, a stainless steel hand auger, or a Shelby tube.

The stainless steel hand auger consists of three basic parts: (1) the bucket, (2) extension, and (3) handle. At the bottom end of the bucket are two cutting edges. The extensions are three feet long. When sampling deeper subsurface soil (Section 4.9.4.4), a number of extensions may be joined end to end to increase the depth from which soil may be sampled.

The Shelby tube is a stainless steel tube approximately 12 inches long and 2 inches in diameter. One end of the tube has the edges beveled into a cutting edge. The other end can be mounted on an adapter which allows attachment to the end of the hand auger. The Shelby tube is pushed into the soil to be sampled and then removed. The tube can then be removed from the adapter and the soil pushed out using a decontaminated piece of equipment such as the handle of a stainless steel spoon. If an undisturbed sample is required, the Shelby tube with its sample intact may be shipped directly to the laboratory for analyses.

4.9.4.4 Deeper Subsurface Soil Sampling — For deeper sampling using hand equipment, a stainless steel auger (see Section 4.9.4.3) is used to bore a sampling hole until the desired depth is reached. Another clean auger bucket or a

Shelby tube is then used to collect the sample which is placed in a glass pan as described in Section -.9.4.1. Surface debris should be removed from the location of the sampling hole using a clean, stainless steel shovel or spoon before augering operations are initiated.

Often the depth which can be reached using a hand auger is limited due to the soil having low conesion which leads to the hole collapsing or to the soil being very tightly packed which can make turning and removing the auger difficult. In cases such as these, a portable power auger Little Beaver® may be used to reach the desired depth. The sample can then be collected as described in the previous paragraph. The portable power auger consists of an powered drive unit (hand-held) used by sampling personnel to drive crew-like auger flights. The auger flights should be cleaned using the same procedures as for the other soil sampling equipment (Appendix B). For safety reasons, the Little Beaver® portable power auger should never be used with less than two sampling personnel present.

The split spoon sampler may be used for sampling at greater depths. Because of its weight, the split spoon sampler is generally used with power equipment, i.e., drilling rig. A hollow stem auger is used to advance the hole to the desired depth. The split spoon is added to the correct length of drill rod and forced into the undisturbed soil by means of a 140-pound weight or hammer. The split spoon is retrieved from the hole and opened to reveal the sample. The top two or three inches of the sample normally will be disturbed and should be discarded. The undisturbed portion should be placed in a glass pan by means of a clean stainless steel spoon or spatula. The procedure is repeated until the desired amount of sample is collected. The sample should then be thoroughly mixed.

4.9.5 Special Precautions for Trace Contaminant Soil Sampling

The procedures outlined in Section 4.2.11 shall be followed. All soil sampling equipment used for sampling for trace contaminants should be constructed of stainless steel where possible. In no case will chromium, cadmium, or galvanized plated or coated equipment be used for soil sampling operations. Similarly, no painted equipment shall be used. All paint and primer must be removed from soil sampling equipment by sandblasting or other means, before such equipment can be used for collecting soil samples.

4.9.6 Soil Samples Collected for Purgeable Organic Compounds Analyses (VOA)

Soil samples collected for purgeable organic compounds analyses should be thoroughly mixed and containerized as soon as possible after sampling. The sample should be placed in the sample container so that no head space is left in the container after the container is closed.

4.9.7 Specific Sampling Equipment Quality Assurance Techniques

Drilling rigs and other major equipment used to collect soil samples shall be identified so that this equipment can be traced through field records. A log book shall be established for this equipment so that all cleaning, maintenance

repair procedures can be traced to the person performing these procedures and the specific repairs made. Sampling spoons, hand augers, Shelby tubes, and other minor disposable type equipment are exempted from this equipment identification requirement.

All equipment used to collect soil samples shall be cleaned as outlined in Appendix B and repaired, if necessary, before being stored at the conclusion of field studies.

Any cleaning conducted in the field (Appendix B) or field repairs should be thoroughly documented in field records.

-.9.8 Auxiliary Data Collection

In addition to information pertaining to an area or specific site/location that may be available in EPA files from previous investigations (i.e., site screenings, water quality, well monitoring studies, etc.) information and data may be obtained from various city, county, state, and other federal agencies.

A system of logging all pertinent data collected during drilling and sampling operations should be maintained. The test hole locations should be recorded and referenced to the site map and/or datum base so that each location can be permanently established. Samples should be accurately tagged and labeled with all pertinent site information at the time of sampling. See Section 3 for sample labeling and field recording procedures. Also, refer to the section on drilling in the Groundwater Sampling Section (Section 4.7.9.3). The latitude and longitude shall be obtained for each site for future STORET data entry.

SOIL SAMPLING

OBJECTIVE - TO PRESENT THE DIFFERENT METHODS AND TECHNIQUES USED IN COLLE
SOIL SAMPLES DURING HAZARDOUS WASTE SITE INVESTIGATIONS AND RELATED STUD
INVOLVING RCRA AND SUPERFUND ACTIVITIES.

SITE SELECTION

- MAKE A RECON OF THE AREA OF INTEREST
- DETERMINE THE BOUNDARIES OF THE AREA
- EVALUATE GENERAL ON-SITE AND OFF-SITE CONDITIONS - DEAD VEGETA OR ANIMALS, GROUND STAINING, LEACHATE STREAMS, ODORS, SOURCES POLLUTION, ETC.
- DETERMINE SURFACE DRAINAGE FLOW DIRECTION(S)
- LOCATE ALL PERTINENT FEATURES - ROCK OUTCROPS, STREAMS, DRAINA DITCHES, DEPOSITIONAL AREAS, FILL AREAS, PONDS, SPRINGS, ETC.
- EVALUATE SOIL CONDITIONS - SANDY SOILS, CLAY SOILS, ROCKY SOI
- DETERMINE THE DEPTH TO THE SHALLOW GROUNDWATER TABLE.
- DETERMINE THE TYPE OF SAMPLE(S) NEEDED - COMPOSITE OR INDIVID SAMPLES
- DETERMINE THE EXTENT OF SAMPLING - SURFACE SAMPLING, SHALLOW SAMPLING OR DEEP DEPTH SAMPLING.
- DETERMINE THE METHOD OF SAMPLING - POWER EQUIPMENT, HAND EQUI OR BOTH.

- ESTIMATE THE NUMBER OF SAMPLES NEEDED AND ANALYSIS REQUIRED - S COLLECT A REPRESENTATIVE FRACTION OF THE SOILS WITH THE MINIMUM NUMBER OF SAMPLES.

SAMPLING EQUIPMENT

- POWER EQUIPMENT - SHALLOW AND DEEP SAMPLING

  A) POWER AUGERS AND DRILLING RIGS
     1) SPLIT SPOON SAMPLERS
     2) LARGE DIAMETER PUSH TUBES

  B) BACKHOE

- HAND EQUIPMENT - SHALLOW SAMPLING

  A) SPOONS - STAINLESS STEEL
  B) SPATULAS - STAINLESS STEEL
  C) SCOOPS - STAINLESS STEEL
  D) SHOVELS
  E) PUSH TUBES (SHELBY TUBES) - SMALL DIAMETER
  F) POST-HOLE DIGGERS
  G) HAND AUGERS

SAMPLING METHODS

- SURFACE AND SHALLOW DEPTH (<10 FT.) SAMPLING

  A) PUSH TUBES - HAND EQUIPMENT
  B) CHUNK SAMPLING
  C) SPOON, SPATULA, AND SCOOP SAMPLING
  D) SHOVELS, POST-HOLE, DIGGERS, PICKS, ETC.
  E) HAND AUGERS

- SHALLOW AND DEEP DEPTH SAMPLING

  A) SPLIT SPOON SAMPLING - POWER EQUIPMENT
  B) PUSH TUBES - POWER AND HAND EQUIPMENT
  C) CHUNK SAMPLING - BACKHOE AND HAND EQUIPMENT

SOIL SAMPLING

Site Selection

Areas selected for soil sampling shall be strategically located in order to collect a representative fraction of the soils with the minimum number of samples and effort. A surface inspection of the subject area shall be made to locate pertinent features (e.g., rock outcrops, drainage patterns, surface runoff, ponds, lakes, wet areas, seeps, springs, permanent structures, fill areas, erosional areas, depositional areas, etc.) and to evaluate the relationship between these features and potential sources of pollution. The locations of sediment depositional areas are good indicators of surface runoff direction. If direction of surface runoff or drainage is difficult to detect, observation of new deposition or sediment movement following a rain may prove helpful in establishing this direction. The spreading or fanning out of the sediment body will indicate direction of flow.

In most instances, the first investigation of a site will be a reconnaissance or screening type study. Sampling in these instances will generally be confined to surface soils or shallow coring using hand equipment such as shovels, post hole diggers, or hand augers. For screening purposes, surface soil/sediment sampling shall be conducted in depositional areas on the periphery of the study area, primarily in the downstream or downgradient portion of the area of interest: however, an upgradient sample is often valuable as a control site. (Note: sampling at depositional areas tends to bias the sampling toward high concentrations - this is a valuable screening tool but should not be construed as representative of the area conditions).

Following initial screening, more sophisticated investigations may involve the use of power equipment such as drilling rigs or backhoes. The number of samples or test holes and the specific depth of sampling will vary according to site conditions and the scope of the investigation. In general, a minimum of three sampling sites or test holes shall be installed in order to adequately determine subsurface conditions. Test holes or sites selected for soil sampling should be located where the water table is far enough below the ground surface so as not to interfere with the sampling operation unless the study involves groundwater sampling.

Sampling of undisturbed soils may be achieved by both hand and power equipment. Hand equipment such as spoons, scoops, shovels, hand augers, and small diameter push tubes are available and shall be used for sampling at shallow depths. Hand equipment is limited even at shallow depths when the soils are difficult to penetrate. Power equipment such as augers and backhoes may be used for sampling at shallow depths when hand boring equipment cannot be utilized. Drilling rigs can be used for both shallow and deep soil sampling.

Shelby tubes or thin wall push tubes can be used with both power and hand equipment to sample undisturbed soils. Stainless steel construction is recommended for most types of sampling. Soils can be extruded from the tubes for logging and selective sampling or sealed and sent directly to the laboratory in the tubes. When using drilling rigs for collecting relatively undisturbed soil samples, split spoon samplers shall be the preferred WSB method. These sampler are made of steel tubing that will split open to reveal the soil sample. The

sample then can be examined, logged, and placed in appropriate sample containers. Hollow stemmed augers shall be used when possible in boring test holes to eliminate potential caving problems and contamination from both soil and water. Shelby tubes or split spoons shall be used with the hollow stemmed augers for sampling. If test holes need to be used for groundwater sampling purposes at a later date, well casing shall be set inside the hollow stemmed augers before augers are pulled out of the hole (see well installation procedures in the Groundwater Sampling section of this chapter).

Sampling Techniques

Undisturbed/uncontaminated (Note: contamination in this context refers to the introduction of foreign materials into the sample through collection methodology) samples of surface exposures such as road banks, creek banks, shallow soil horizons, test pits and trenches may be obtained as push tube samples and "chunk" samples. A push tube sample is collected by pressing or pushing a tube firmly into the soil until the tube is full of sample; the sample is extracted by digging to a depth below the sample, while making sure that the sample is not disturbed. The sample is cut off at the bottom of the tube with a shovel or knife and removed from hole. The sample may then be shipped to the laboratory or extruded and placed in sample containers. A "chunk" sample is obtained by smoothing the ground or face surface to remove any disturbed soil, and marking the outline of the chunk to be taken. A trench is then excavated around the chunk. The chunk is cut off with a knife or trowel, trimmed, removed from the hole and placed directly into the appropriate sample container(s) for shipment to the laboratory (19).

Another method of obtaining an uncontaminated (see previous note) soil sample from the soil surface is to use a spoon or scoop. Shallow depth samples may be collected by digging a hole with a shovel, then removing all the loose soil and collecting a sample at the desired depth using a sampling spoon. For deeper sampling using hand equipment, a large diameter auger is used until the desired depth is reached. A small diameter auger is then used to collect the sample. If an undisturbed sample is required, a Shelby tube can be placed on a sampling head connected to the correct length of push rod and pushed into the undisturbed soil. The sample is extruded, the portions that are disturbed and/or contaminated are discarded, and the remainder is placed in the appropriate sample container(s). The Shelby tube and sample may also be shipped intact to the laboratory for analyses. These procedures shall be repeated until the desired number of samples are collected.

The split spoon sampler is used mostly with power equipment because of its weight. The hollow stem auger is used to advance the hole to the desired depth. The split spoon is added to the correct length of drill rod and forced into the undisturbed soil by means of a 140 pound weight or hammer. The split spoon is retrieved from the hole and opened to reveal the sample. The top two or three inches of the sample normally will be disturbed and should be discarded. The undisturbed portion should be placed in a sample container by means of a clean stainless steel spoon or spatula. The procedure is repeated until the desired number of samples are collected.

Sediment samples can be obtained by means of grab sampling. This method consists of collecting sediment in a sample container by scooping or by using

a spoon, small shovel, spatula, jar, or bottle to place the sediment in the container. There are also various types of mechanical samplers available, especially where sediment sampling in water is required. Refer to the section on surface water sampling in this chapter for information on sediment sampling equipment and techniques.

Specific Sampling Equipment Quality Assurance Techniques

All sampling equipment utilized to collect soil samples including hand augers, split spoons, hollow stem augers, drilling rigs, Shelby tubes, etc., will be numbered so that this equipment can be traced through field records. A log book shall be established for this equipment, so that all cleaning, maintenance and repair procedures can be traced to the person performing these procedures and to the specific repairs made. It should be noted that quality control procedures for certain pieces of equipment, such as sediment sampling equipment, are contained elsewhere in this chapter and that sampling spoons and other minor disposable type equipment are exempted from this requirement.

All equipment utilized to collect soil samples shall be cleaned as outlined in Appendix C and repaired if necessary before being stored at the conclusion of field studies.

All such equipment shall be tested before being issued for field studies.

Any cleaning procedures conducted in the field (Appendix C) or field repairs should be thoroughly documented in field records.

Auxiliary Data Collection

Before and after sites have been selected, additional information and data can be collected from various city, county, state, and federal agencies. Most areas of concern to EPA usually have data from surveys or studies that have been previously made. Water quality studies, hydrologic and geologic data, soil surveys, and well monitoring studies are examples.

A system of logging all pertinent data collected during drilling and sampling operations should be used and maintained. The test hole locations should be recorded and referenced to the site map and/or datum base so that each location can be permanently established. Samples should be accurately tagged and labeled with all pertinent site information at the time of sampling. See Chapter III for sample labeling and field recording procedures. Also, refer to the section on drilling logs in the Groundwater Sampling section of this chapter.

ATTACHMENT L

COLD STRESS

COLD EMERGENCIES

On days with low temperatures, high winds, and humidity anyone can suffer from the extreme cold. Severe cold exposure can be life-threatening. Several factors increase the harmful effects of cold being very young or very old, wet clothing, having wounds or fractures, smoking, drinking alcoholic beverages, fatigue, emotional stress, and certain diseases and medications. People exposed to severe cold can suffer from hypothermia or frostbite.

Hypothermia

Signs and Symptoms

The signs and symptoms of hypothermia include shivering, dizziness, numbness, confusion, weakness, impaired judgment, impaired vision, and drowsiness *(Fig. 47)*. The stages are—

1. Shivering.
2. Apathy.
3. Loss of consciousness.
4. Decreasing pulse rate and breathing rate.
5. Death.

As hypothermia progresses, the victim may move clumsily and have trouble holding things. In the later stages, he or she may stop shivering.

Figure 47
Hypothermia

First Aid

As the action guide shows, call EMS. You should get a victim of hypothermia out of the cold and into dry clothing. Warm up his or her body slowly. Give nothing to eat or drink unless the victim is fully conscious. Monitor ABCs.

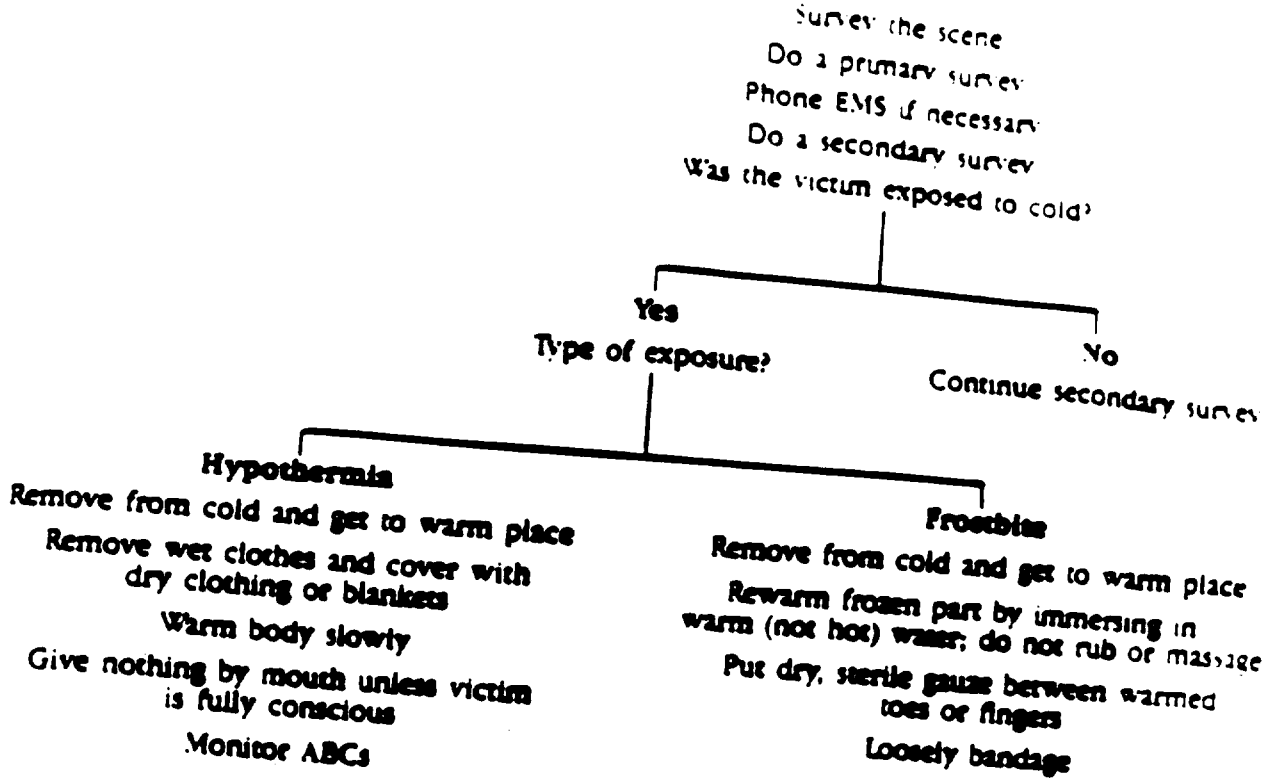
Frostbite

Frostbite is the most common injury caused by exposure to cold. It happens when ice crystals form in body tissues, usually the nose, ears, chin, cheeks, fingers, or toes. This restricts blood flow to the injured parts. The effect is worse if the frostbitten parts are chewed and then refrozen.

Signs and Symptoms

The first sign of frostbite may be that the skin is slightly flushed. The skin color of the frostbitten area then changes to white or grayish yellow and finally grayish blue, as the frostbite develops. Pain is sometimes felt early on but later goes away. The frostbitten part feels very cold and numb. The victim may not be aware of the injury.

Cold Emergencies



For hypothermia, warm the victim slowly. Rapid warming could cause serious heart problems or increase circulation to body surface, causing additional cooling of vital organs.
Do not give beverages containing alcohol or caffeine.
Give warm broth or water.

should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

2. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

Evaluation and Control

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of −32°C (−25.6°F). Superficial or deep local tissue freezing will occur only at temperatures below −1°C (30.2°F) regardless of wind speed.

At air temperatures of 2°C (35.6°F) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

TLVs recommended for properly clothed workers for periods of work at temperatures below freezing are shown in Table 3.

Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

1. If fine work is to be performed with bare hands for more than 10–20 minutes in an environment below 16°C (60.8°F), special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below −1°C (30.2°F).
2. If the air temperature falls below 16°C (60.8°F) for sedentary, 4°C (39.2°F) for light, −7°C (19.4°F) for moderate work and fine manual dexterity is not required, then gloves should be used by the workers.

To prevent contact frostbite, the workers should wear anti-contact gloves.

1. When cold surfaces below −7°C (19.4°F) are within reach, a warning should be given to each worker by the supervisor to prevent inadvertent contact by bare skin.
2. If the air temperature is −17.5°C (0°F) or less, the hands should be protected by mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.

Provisions for additional total body protection are required if work is performed in an environment at or below 4°C (39.2°F). The workers should wear cold protective clothing appropriate for the level of cold and physical activity:

1. If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.
2. If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outerwear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a hot environment before entering the cold area, the employee should make sure that clothing is not wet as a consequence of sweating. If clothing is wet, the employee should change into dry clothes before entering the cold area. The workers should change socks and any removable felt insoles at regular daily intervals or use vapor barrier boots. The optimal frequency of change should be determined empirically and will vary individually and according to the type of shoe worn and how much the individual's feet sweat.
3. If exposed areas of the body cannot be protected sufficiently to prevent sensation of excessive cold or frostbite, protective items should be supplied in auxiliary heated versions.
4. If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.
5. Workers handling evaporative liquid (gasoline, alcohol or cleaning fluids) at air temperatures below 4°C (39.2°F) should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of "cryogenic fluids" or those liquids with a boiling point that is just above ambient temperature.

Work–Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below −7°C (19.4°F), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals, the frequency depending on the

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air Temperature – Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4
-29° to -31°	-20° to -24°	(Norm. Breaks)	1	75min	2	55 min	3	40 min	4	30 min	5
-32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
-40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
-43° & below	-45° & below	Non-emergency work should cease									

Notes for Table 3:

†1. Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour work period in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -35°C (-30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m²; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m². In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

* Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour

severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability or euphoria are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing should be provided as necessary to prevent workers from returning to work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of the diuretic and circulatory effects.

For work practices at or below -12°C (10.4°F) ECT, the following should apply:

1. The worker should be under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods should be taken in heated shelters and opportunity for changing into dry clothing should be provided.
3. New employees should not be required to work fulltime in the cold during the first days of employment until they become accustomed to the working conditions and required protective clothing.
4. The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.
5. The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
6. The workers should be instructed in safety and health procedures. The training program should include as a minimum instruction in:
   a. Proper rewarming procedures and appropriate first aid treatment.
   b. Proper clothing practices.
   c. Proper eating and drinking habits.
   d. Recognition of impending frostbite.
   e. Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
   f. Safe work practices.

Special Workplace Recommendations

Special design requirements for refrigerator rooms include the following:

1. In refrigerator rooms, the air velocity should be minimized as much as possible and should not exceed 1 meter/sec (200 fpm) at the job site. This can be achieved by properly designed air distribution systems.
2. Special wind protective clothing should be provided based upon existing air velocities to which workers are exposed.

Special caution should be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace monitoring is required as follows:

1. Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16°C (60.8°F) so that overall compliance with the requirements of the TLV can be maintained.
2. Whenever the air temperature at a workplace falls below -1°C (30.2°F), the dry bulb temperature should be measured and recorded at least every 4 hours.
3. In indoor workplaces, the wind speed should also be recorded at least every 4 hours whenever the rate of air movement exceeds 2 meters per second (5 mph).
4. In outdoor work situations, the wind speed should be measured and recorded together with the air temperature whenever the air temperature is below -1°C (30.2°F).
5. The equivalent chill temperature should be obtained from Table 2 in all cases where air movement measurements are required; it should be recorded with the other data whenever the equivalent chill temperature is below -7°C (19.4°F).

Employees should be excluded from work in cold at -1°C (30.2°F) or below if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below -24°C (-11.2°F) with wind speeds less than five miles per hour, or air temperatures below -18°C (0°F) with wind speeds above five miles per hour, should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissues in addition to providing for first aid treatment.

ATTACHMENT Z

SITE SAFETY PLAN

ACKNOWLEDGMENT FORM

[redacted]

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I have been informed and understand and will abide by the procedures set forth in the Safety and Health Plan and Amendments for the Sauget Landfill site.

Printed Name	Signature	Representing	Date
Basil Nagel	Basil Nagel	B.E.S.	3/20/95
Kevin Hall	Kevin Hall	KES	3/20/95

ATTACHMENT D

PERSONAL PROTECTIVE EQUIPMENT AND RESPIRATORY PROTECTION SOP'S

INSPECTION OF PERSONAL PROTECTIVE CLOTHING

[1] Determine that clothing material is correct for specified task
- a. compatibility chart
- b. chemical hazard chart in Safety Plan
- c. MSDS

[2] Visually inspect material for:
- a. imperfect seams
- b. non-uniform coatings
- c. tears
- d. discoloration/degradation
- e. malfunctioning closures

[3] Hold up to light and check for pinholes.

[4] Flex material:
- a. observe for cracks
- b. other signs of shelf deterioration

[5] If the material has been used previously, inspect inside and out for signs of chemical penetration/degradation
- a. discoloration
- b. swelling
- c. stiffness

[6] During the work task:
- a. evidence of discoloration/degradation
- b. closure failure
- c. tears
- d. punctures
- e. seam discontinuities

RESPIRATORY PROTECTION

General Guidelines

[1] All personnel required to use respirators will select and use the respirators based upon guidelines established by OSHA, NIOSH, and the RES Respiratory Protection Program.

[2] All individuals required to wear respirators will have received a documented pre-issue qualitative fit test for the MSA full-face.

[3] Each individual will be responsible for conducting a positive/negative fit check each time the respirator is donned.

[4] Each individual shall be responsible for cleaning his/her own respirator at least once daily and is permitted to leave the work area to wash his/her own respirator as needed.

[5] Cartridges or filters shall be changed after each daily use or whenever an increase in breathing resistance/odor is detected, or if they become wet. All changes will be made in uncontaminated areas.

[6] No RES employee shall wear a respirator until he/she has been examined by a physician and determined to be physically able to wear respiratory protection. This examination shall be documented at the site.

[7] All personnel must be qualitively fit test every six months.

Air Purifying Respirator Inspection and Checkout

[1] Visually inspect the entire unit for any obvious damages, defects, or deteriorated rubber.

[2] Make sure the facepiece harness is not damaged.

[3] Inspect lens for damage and proper seal in facepiece.

[4] Exhalation Valve
Pull off plastic cover and check valve for debris, tears, or deformities in the neoprene valve.

[5] Inhalation Valve
Screw off cartridges/canister and visually inspect neoprene valves for tears. Make sure than inhalation valves and cartridge receptacle gaskets are in place.

[6] Insure that the speaking diaphragm retainer ring is hand tight.

[7] Make sure than you have the correct cartridge.

[8] Don and perform positive and negative pressure check.

Storage of Air Purifying Respirators

[1] OSHA requires that respirators be stored to protect against:

* Dust
* Sunlight
* Heat
* Extreme Cold
* Excessive Moisture
* Damaging Chemicals
* Mechanical Damage

[2] Respirators must be stored in a clean area which is not likely to be contaminated by the work in progress.

[3] Respirators should not be hung from their headbands for prolonged periods of time.

SCBA Inspection and Checkout

[1] Monthly Inspection

a. check cylinder label for current hydrostatic test date
b. inspect cylinder for large dent or gouges
c. inspect cylinder gauge for damage
d. complete routine inspection
e. fill out inspection documentation card

[2] Routine Inspection

a. Pre-Operational
   * high-pressure hose connector is tight on cylinder fitting
   * by-pass valve is closed
   * mainline valve is closed
   * regulator outlet is not covered or obstructed

b. Backpack and Harness Assembly
   * inspect backpack/harness straps for wear, damage, secure
   * check wear and function of belts
   * check backplate and cylinder holder for damage

c. Cylinder and High Pressure Hose Assembly

* check cylinder to insure firmly attached to backplate
* open cylinder valve; listen or feel for leakage around packing and hose connection
* check high pressure hose for damage or leaks

d. Regulator

* cover regulator outlet with palm of hand
* open mainline valve
* remove hand from regulator outlet
* open by-pass valve slowly to assure proper function
* close by-pass valve
* open mainline valve
* note pressure reading on regulator gauge
* close cylinder valve while keeping hand over regulator outlet
* slowly remove hand from outlet and allow air to flow
* note pressure when low pressure warning alarm sounds; it should be 550-650 psi
* close mainline valve
* check regulator for leaks by blowing air into regulator for 5-10 seconds
* draw air from outlet for 5-10 seconds
* if a positive pressure or vacuum cannot be maintained, there is a leak.

e. Facepiece & Corrugated Breathing Hose

* inspect head harness and facepiece for damage, serrations, and deteriorated rubber
* inspect lens for damage and proper seal in facepiece
* inspect exhalation valve for damage and dirt buildup
* stretch breathing hose and carefully and inspect for holes and deterioration
* inspect connector for damage and presence of washer
* perform negative pressure test with facepiece donned

f. Storage

* refill cylinder to 2216 psi
* close cylinder valve
* tightly connect high pressure hose to cylinder
* bleed pressure from high pressure hose by opening mainline valve
* close by-pass valve
* close mainline valve
* fully extend all straps
* store facepiece in a clean plastic bag for protection

ATTACHMENT E

ALCOHOL AND DRUG PROCEDURES
(Riedel only)

ALCOHOL AND DRUG POLICY (Riedel only)

[1] No personnel are to report to the site under the influence of drugs or alcohol.

[2] Failure to comply will result in being barred or removed from the site and/or other disciplinary action.

[3] All RES employees will receive, and pass, a drug screen prior to work beginning.

[4] A drug screen will be required of any personnel involved in an accident requiring medical attention.

a. The Response Manager is responsible for assuring that they have a copy of all Riedel employee's signed consent forms.

b. The supervisor will accompany the injured worker to the clinic for medical treatment and collection of the drug urinalysis.

[5] Response Manager will insure that they have Med-Tox Drug and Alcohol Kits on site.

ATTACHMENT F

ACCIDENT REPORTING/INVESTIGATIONS

RIEDEL ACCIDENT REPORTING/INVESTIGATIONS

- All injuries or accidents must be reported to the Response Manager or Site Safety Officer immediately.

- The Response Manager will conduct an immediate investigation of the accident and document all results on the Supervisor's Accident Investigation Report and State Worker's Compensation Form.

- The Response Manager will assign a supervisory individual to accompany all injured personnel to the clinic and follow guidelines outlined in the RET Return to Work Program.

- Copies of all Supervisor's Accident Reports will be sent to the Riedel Corporate Director of Health and Safety.

ATTACHMENT G

SITE WALKTHROUGHS/ENTRY

STANDARD OPERATING PROCEDURES FOR SITE ENTRY

JANUARY 1990

Prepared by

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CONTENTS

LIST OF FIGURES

1 INTRODUCTION

A key element in any hazardous waste site investigation is actual entry into the site. A safe and proper entry requires a careful and coordinated team effort before, during, and after actual entry.

The entry team must conduct and complete reconnaissance of the site, as well as undertake other tasks in unfamiliar surroundings, in a variety of situations, and with unknown hazards. The goals are to complete the tasks while maintaining and protecting the health and safety of E & E and subcontractor personnel.

E & E has established Standard Operating Procedures (SOPs) to serve as training and guidance tools during the planning and implementation of all phases of a site investigation. Of primary concern is the health and safety of personnel. This is organized under the Corporate Health and Safety Program and blueprinted in the Corporate Health and Safety Plan for Toxic and Hazardous Substances. Other phases of investigations are addressed in other SOPs, thus, those SOPs should be carefully revieved prior to a site investigation.

This document presents site entry procedures and guidelines for all E & E personnel working on hazardous waste sites.

1.1 OBJECTIVES

The primary objective of the Site Entry SOP is to provide operating guidelines and to establish procedures for the entry and inspection of hazardous waste sites. It encompasses preplanning, site safety considerations, entry procedures, on-site guidelines, site egress, and decontamination procedures. This document is not designed to present site-specific procedures, but describes procedures applicable to a vide variety of hazardous waste sites.

1.2 SCOPE AND LIMITATIONS

The procedures outlined in this SOP are applicable to all E & E personnel who participate in the inspection or investigation of sites where chemical or biological contamination is known or suspected.

The provisions of this document are not binding on non-E & E personnel, unless othervise specified under contractual agreement. However, non-E & E personnel will be encouraged to follov these procedures.

This document is applicable only to the conditions and limitations specified within and does not address operations at radioactive or asbestos sites, or barrel-opening operations. For asbestos inspection,

assessment, or abatement oversight projects, please refer to E & E Corporate Guidelines for Asbestos Inspection/Assessment, Laboratory Analysis, and Abatement Oversight, October 1987.

2 POLICIES AND DOCUMENTATION

2.1 POLICIES

The health and safety of site inspection personnel has precedence over all other considerations in dealing with hazardous materials. When inspection personnel must be exposed to hazardous substances, every effort should be made to ensure that concentrations are as low as reasonably achievable. E & E has established specific health and safety policies and guidelines, set forth in the E & E Health and Safety Plan for Toxic and Hazardous Substances.

Entry into a known or suspected contaminated waste site will be conducted only when such entry is required to gather information not obtainable by any nonentry means. The time on site will be kept as short as possible. Entry onto any hazardous waste site is expressly forbidden unless conducted as part of a work assignment.

The Regional Manager/Supervisor and/or his or her designated assistant will appoint a Site Safety Officer (SSO) for each on-site inspection or investigation where there is suspected hazardous substance contamination.

The SSO, in consultation with the Project Team Leader (PTL) will, in accordance with this and other SOP documents, make decisions regarding:

- The potential hazards present;
- The type of protective clothing to be worn;
- The type of respiratory protection to be worn;
- The type of decontamination solution(s) to be used;
- The distance to the exclusion area boundary; and
- The location of the Command Post (CP), the personnel decontamination station (PDS), and the contamination control line (CCL).

The PTL will assume full responsibility for the action of E & E personnel only. The PTL will assume no responsibility for the action of non-contractor personnel. Non-contractor personnel entering the

hazardous waste site will be advised of the hazards present and safety precautions deemed necessary. If non-contractor personnel choose to enter the hazardous waste site in disregard of the PTL's advice, then official written notification will be made in the daily log, and the Regional Manager/Supervisor will be advised of the situation. The PM or regional manager will be advised of the situation. If the actions of non-E & E personnel result in a threat to the welfare of E & E personnel, the PTL can choose to cease on-site operations until the situation is resolved.

2.2 DOCUMENTATION

Before site entry, documentation should be completed to address the legal, health, and safety issues of site access. Legal issues concerning E & E's right to enter the site are resolved by obtaining permission to access the property(ies) that incorporate the site. This permission may be granted by the property owner(s) or by appropriate judicial authorities. Documentation of permission, in the form of a court order or written authorization, should be available for disclosure at the site during the investigation.

The PTL, PM, and SSO will be responsible for maintaining all records, logs, and reports required for, or generated by the on-site activities (refer to E & E's logbook SOP). Records will be kept of the following:

- A log of all information (i.e., calibrations) and all data from personnel monitoring devices and instruments (e.g., dosimeters and personnel air sampling devices);
- An on-site activity log (updated hourly) to record the progress of each activity, field data from each sample collected, tracking numbers, and other information for all samples; and
- An on-site safety log of all personnel, safety activities (e.g., monitoring activities and results), changes from the original safety plan, protective steps taken, special problems encountered, and solution measures taken.

In addition, photo-documentation of site conditions is vital in any investigation and can prove to be indispensable for later use in site evaluations, reports, or litigation proceedings. It is important that all information concerning each photograph be recorded in the field logbook.

3 FIELD OPERATIONS

3.1 SITE SAFETY CONSIDERATIONS

Upon initial entry into a site, the investigation team performs a variety of tasks in unfamiliar surroundings with unknown hazards. The team members wear protective clothing and respiratory protection devices that restrict and hinder both movement and vision. If the entry is to be performed smoothly and safely, proper planning and procedures must be established.

The necessity to enter a site must first be evaluated before any other site questions can be addressed. Site access will be considered a work alternative only if it is to gather information that is not available from other off-site sources.

Assurance of a safe investigation hinges on proper planning and implementation. The following are four fundamental site-safety components:

- o Thorough background search for site characterization,
- o Development of a comprehensive Site Safety Plan (SSP) and work plan,
- o Implementation of approved site-specific safety plan, and
- o Use of common sense in safe work practices.

3.1.1 Background Search

The background search occurs during the planning stages of the projects and is inherently linked to the formation of the SSP and work plan (Section 3.1.2). Staff conduct a review of all background material and available data, focusing on the past history of the site, the materials used or disposed of at the site, data and information from previous investigations, past site conditions, as well as present activity and condition of the site. This information is available from a variety of sources:

- o Client records;
- o Aerial photographs;
- o Federal, State, or local agency files; and
- o National or regional data bases.

3.1.2 Site Categorization

Because there are so many, varied sites, E & E has developed three categories or types of sites for planning purposes. Using these types provides a viable means of selecting levels of personnel and respiratory protection:

- Site Type I: Apparent No-Problem Site (see Figure 1). All background information indicates that there is no hazard associated with this site. If the correct response to all of the items depicted in Figure 1 can be obtained, then E & E personnel may conduct the investigation in Level D protection.

- Site Type II: Industrial Workplace Site (see Figure 2). Team members must conduct extensive research to determine if the safety precautions in force at the industrial workplace sites are adequate for E & E personnel. (See Figure 2 for the review process.) If the review process indicates that the existing level of protection is adequate, then the team may enter the site in the same level of protection as the industrial worker. If review indicates a higher level of protection is required, these findings should first be discussed with the proper site authorities. It would not be prudent for team members to appear at a site in a higher level of protection without first informing the site managers.

- Site Type III: Legitimate Uncontrolled Hazardous Substance Facility (see Figure 3). For a legitimate uncontrolled hazardous substance facility, the need for higher levels of protection should be evaluated against the potential of skin contact and inhalation. To assist in this evaluation, E & E has developed decision guidance matrices for assigning personnel equipment levels on a Type III site (see Figure 4). These decision matrices require simple "yes" or "no" answers to achieve succeeding levels of decision. After determining the proper clothing for site entry, teams must determine if there is an apparent respiratory hazard. Figure 5 lists conditions that should be considered in determining if there is an apparent respiratory hazard. If no respiratory hazard is present an initial entry survey should then be conducted. In cases for which no background information is available to determine respiratory hazard, the SSO should require use of respirators for site entry.

3.1.3 Site Safety and Work Plan Development

Many health and safety concerns associated with the inspection or investigation of a hazardous waste site are related to the nature of the site and the extent of the work to be performed. Consequently, the SSP is a site-specific document that lists the objectives of the on-site

SITE TYPE I:
"APPARENT NO-PROBLEM SITE"

REVIEW PROCESS:

1. **ATTEMPT TO COMPLETE INVESTIGATION WITH PERIMETER INSTRUCTIONS**
2. **IF THERE IS A NEED TO ENTER, DO SO (LEVEL D) ONLY IF THE FOLLOWING APPLY:**
   - **a. Task limited to brief visual inspection**
   - **b. No containers of unknown or known hazardous substances visible**
   - **c. No unknown odors or known odors of hazardous substances**
   - **d. Good natural air circulation**
   - **e. Visible or historic evidence of accessibility to humans; no ill health effects**
   - **f. No visible dead animals or vegetation**

Figure 3-1 SITE TYPE I CHARACTERISTICS

SITE TYPE II:
INDUSTRIAL WORKPLACE SITE

REVIEW PROCESS:

1. **REVIEW SITE HISTORY; ESTABLISH TYPE OF WORKPLACE**
2. **INVENTORY WORKPLACE CHEMICAL HAZARDS**
3. **ESTABLISH APPLICABLE INDUSTRY STANDARDS (CONSULT REGIONAL OSHA/NIOSH OFFICES)**
4. **IF FACILITIES ONGOING HEALTH AND SAFETY PROGRAM IS ACCEPTABLE AND IF INVESTIGATIVE TASK PRESENTS NO ADDITIONAL RISK, USE WHAT THEY USE AS A MINIMUM**

Figure 3-2 SITE TYPE II CHARACTERISTICS

SITE TYPE III: LEGITIMATE UNCONTROLLED HAZARDOUS SUBSTANCE FACILITY

1. EVALUATE NEED FOR LEVEL A — EMERGENCY ACTION
2. SPLASH PROTECTION NEEDED FOR INITIAL ENTRY?
3. CONDUCT INITIAL ENTRY
4. IS THERE AN APPARENT RESPIRATORY HAZARD?

   YES—Continue investigation in SCBA s and any necessary splash protection

   NO— Continue investigation without respiratory protection

5. WORK CONTINUES WITH AMBIENT MONITORING AND REVALUATION OF PERSONAL PROTECTION NEEDS

Figure 3-3 SITE TYPE III CHARACTERISTICS

DECISION GUIDANCE FOR ASSIGNING PEL ON TYPE III SITES

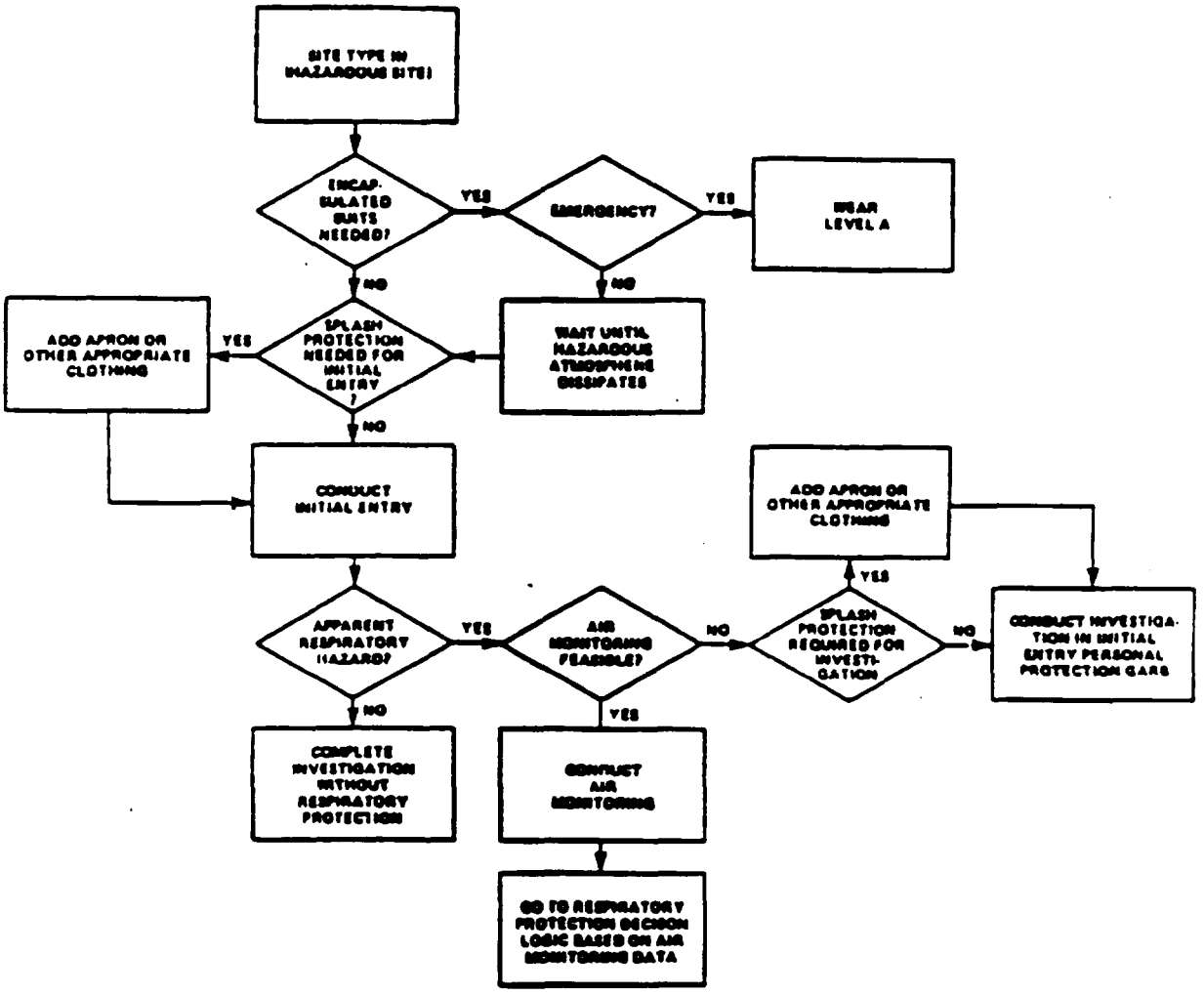

Figure 3-4 DECISION GUIDANCE FOR ASSIGNING PEL ON TYPE III SITES

NO APPARENT RESPIRATORY HAZARD

1. NO DRUMS, LAGOONS, OR OTHER CONTAINERS OF UNKNOWN CONTENTS IN CLOSE PROXIMITY TO WORK AREA
2. SITE HAS GOOD AIR CIRCULATION
3. NO ILL HEALTH EFFECTS ASSOCIATED WITH SITE
4. INVESTIGATION DOES NOT REQUIRE EXCAVATION, DRILLING, OR DRUM OPENING
5. HISTORICAL REVIEW GIVES GENERAL IDEA OF SUBSTANCES PRESENT
6. OTHER?

Figure 3-6 NO APPARENT RESPIRATORY HAZARD

work and describes the health and safety procedures and protocols that will be followed during the completion of those work objectives. (See Appendix A - Site Safety Plan).

The plan provides a written outline of the steps that are to be followed, eliminates the uncertainties of memory, and provides a checklist for preparing the site entry. It forces the writer to identify and organize the available data and then to construct a logical, coherent, and workable plan based on the data. As a written report, it is to be revieved by peers, who should identify inadequacies.

First, the plan must include site background information, safety information, and instructions and procedures for both routine and emergency situations to ensure that the risk of accident or injury is minimized. Second, it should allow for contingencies that will permit adaptations, at the discretion of the PM and the SSO, as new information is gathered and field conditions fluctuate. Finally, the plan must be presented in a concise, written format so that it is available as a source of site-specific safety and health information to team members.

Under certain conditions, safety plans may be subject to modifications by the PTL and SSO on site. If the danger appears to be greater than originally anticipated, the SSO has the option of immediately withdrawing the team or increasing the level of protection. If the danger was overestimated, the SSO can allow the site to be examined at a lower level of protection, provided that the SSP describes the rationale and the specific protection level to which the site can be downgraded.

When site conditions warrant modification to the operating procedure or the level of personal protection required, the changes and conditions should be thoroughly documented. If the modification results in significant changes, such as downgrading to a lower level of protection, the RSC will be informed. The SSO must present the rationale for making the changes and must provide sufficient monitoring data to justify the reduction in the level of protection. Team members will not use a level of protection less than that required in the SSP for each specific exclusion area or subarea until that decision has been approved by the RSC.

The work plan, like the safety plan, is a written outline of the work to be performed on site and the methods used to complete the investigative tasks. Because it is peer revieved, inadequacies or unsafe procedures should be identified and modified. In many cases, the work plan is produced as part of the project proposal, or for review by the client.

A work plan should contain details of the site investigation that include, but are not limited to the following:

- o Initial entry and characterization;
- o Inventory of site materials and conditions;
- o Sampling plan and analysis required;
- o Geophysical explorations;
- o Groundwater monitoring-well installation;
- o Decontamination methods; and
- o Disposal of site-derived materials (drill cuttings, decontamination fluids, disposable gear).

3.1.4 Meetings and Training

Before on-site activities are initiated, the SSO will coordinate to the degree necessary (based on the site hazard level as determined by the PM) with local medical and emergency authorities to inform them of planned activities and special treatment or response needs in the event of injury or exposure.

Before the site entry, the SSO will conduct as many meetings or training sessions as necessary to ensure that all personnel who enter the site have a thorough understanding of health, safety, and operational aspects of on-site activities. Issues to be addressed during these meetings and training sessions may include, but are not limited to the following:

- o Potential hazards associated with the site;
- o Safety procedures (including the route to the designated emergency medical facility), specific hazards associated with on-site contaminants (as presented on the Hazard Evaluation of Chemicals worksheet), and team response organization and responsibilities in the event of an injury or contamination incident;
- o Monitoring instrument operation and monitoring frequency requirements;
- o The level(s) of personnel and respiratory protection required in each phase of planned on-site activity;
- o Protective equipment fit and operation;

- o Decontamination requirements and procedures;
- o Site-control procedures, including the designation of work and exclusion zones, and site-entry and -exit procedures; and
- o Contingency plans to protect the public and the environment in the event of an emergency.

All team members (including subcontractors and supervisory personnel) will sign the On-Site Safety Meeting Form in the SSO's copy of the SSP at the end of the safety meeting(s). By signing the form, each team member indicates that the on-site hazards and site safety procedures and protocols have been explained by the SSP to his or her understanding. The form must be signed before site entry.

3.1.5 General Safety Rules and Requirements

Team members are aware of their responsibility to follow the general on-site safety practices and regulations that are necessary to meet the goals of E & E's Health and Safety Plan. These include the following:

1. There will be no eating, drinking, or smoking in the exclusion area or the contamination reduction area.
2. All personnel must pass through the contamination reduction area when entering or exiting an exclusion zone at sites where an exclusion zone has been established.
3. All monitoring requirements specified in the SSP will be carried out by trained personnel with properly maintained and calibrated equipment.
4. Emergency equipment (e.g., portable showers, eye washes, fire extinguishers) will be on the hot line side of the contamination reduction area for quick access when such equipment has been included in the SSP.
5. Specific emergency equipment requirements for the clean side of the contamination reduction area will be specified in the SSP.
6. At the end of the workday, all personnel who have worked inside the exclusion zone (including the contamination reduction area) will take a hygienic shower, regardless of perceived exposure possibilities.
7. All supplied breathing air shall be certified Grade D (American National Standard, Commodity Specification for Air) or better.

8. Where practical, all tools and equipment shall be spark-proof, explosion resistant, U.L. (Underwriters Laboratory) bonded and grounded.

9. Fire extinguishers, for use on equipment or small fires, will be on all sites in a location familiar to all site personnel.

10. All team members will be aware of emergency response and emergency evacuation responsibilities, procedures, protocols, and signals. Deviations from standard emergency protocols will be specified in the SSP. Personnel responsibilities will be outlined before site entry.

11. A first aid kit, which has been stocked to handle all of the first aid situations covered in the Red Cross standard first aid course, will be available in a marked location on site at all times. Additional first aid equipment needs and procedures will be specified in the SSP, as needed.

12. Safety and training meeting(s) will be held before site entry and, if necessary, each morning, to cover or review all site specific safety issues.

Additional guidelines are presented in Figure 6.

3.1.6 Radiological Hazards

At known or suspected contaminated waste sites, radiological hazards are not necessarily isolated from other hazards which may be physical, chemical, or biological. The inspection team must always be alert to the potential presence of radiological hazards which may represent an equal or greater threat to health and safety than the hazardous waste.

If the historical background study does not indicate that radiological materials are present and the initial entry survey shows that there is radiation above the background level, all E & E personnel will leave the site; and the SSO will notify the E & E RSC.

3.2 ORGANIZATION OF THE FIELD INVESTIGATION AREA

There are no absolutes in organizing the layout of the field investigation area. Distances between each of the various components at the field site will vary depending on the weather, terrain, location, and types of contaminants on the site. The knowledge acquired through planning, together with an off-site reconnaissance around the perimeter of the suspected site, generally will provide the information needed to establish a rough boundary for the site. See Figure 7 for standard organization of the field investigation area.

SITE SAFETY PROCEDURES

- OBSERVE BUDDY SYSTEM
- PLAN YOUR ACTIONS—BE DELIBERATE
- MAINTAIN CONTACT WITH SAFETY OFFICER
- PRACTICE CONTAMINATION AVOIDANCE
  - Don't sit or kneel on ground
  - Don't ground equipment
  - Avoid obvious contamination
- DON'T CLIMB OVER BARRELS OR OBSTACLES
- FOLLOW PREDESIGNATED ROUTES
- MONITOR (AS REQUIRED) FOR
  - Radiation
  - O_2 levels
  - Explosive hazard
  - Buried metal
- MONITOR WEATHER CONDITIONS
  - Heat stress
  - Cold (frostbite)
  - Electrical storms
  - Wind direction

Figure 3-6 SITE SAFETY PROCEDURES

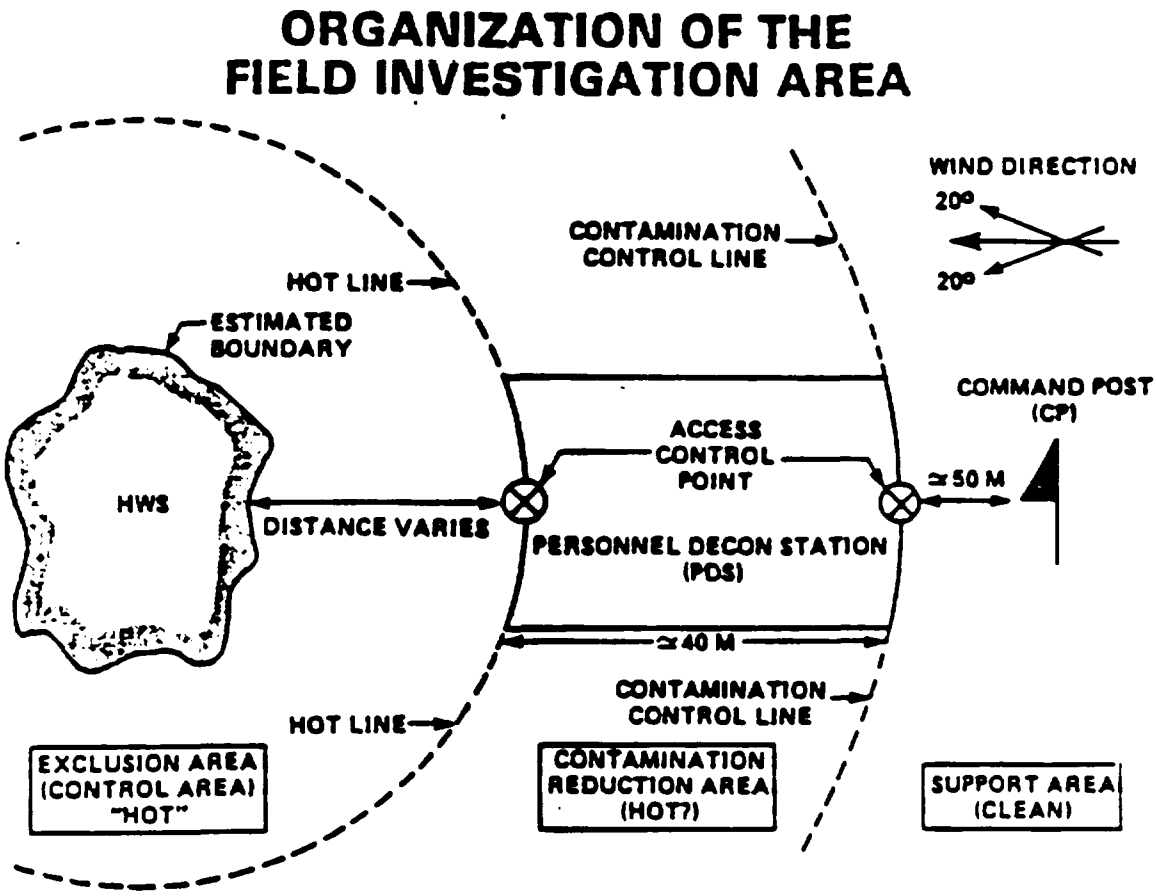

Figure 3-7 ORGANIZATION OF THE FIELD INVESTIGATION AREA

When establishing the organization and layout of the area, the two prime objectives are to minimize the potential for exposure and to restrict the spread of contaminated materials outside of the hazardous waste site.

3.2.1 Exclusion Area (Control Area)

The first priority in approaching the area of an uncontrolled chemical or biological waste site is to establish an exclusion or control area. This area acts as a buffer zone between the known or suspected contaminated area and the clean area. Initially, it is always assumed that the surface within the exclusion area is contaminated. The size of the exclusion area will vary depending on the nature of the site. The factors considered in establishing the exclusion area are:

- o Nature and toxicity of the site contaminants,
- o Explosive potential,
- o Meteorological condition,
- o Topography,
- o Concern for the unprotected public, and
- o Emergency egress routes from the site.

Safety is the primary consideration to be followed in the establishment of the exclusion area boundary. After an initial assessment of the site has been made by an initial entry party, it is always possible to reduce or increase the size of this area.

3.2.2 Hot Line

The hot line is located on the outer exclusion area boundary near the chemically or biologically contaminated area. This line is arbitrarily selected as the point at which a deliberate attempt is made at controlling any contamination picked up by personnel as they work on the hazard site. The access control point on the hot line is the point established through which all personnel are to enter and egress the exclusion area. The hot line can be adjusted down-range to reflect additional information learned about the site.

3.2.3 Contamination Reduction Area

The contamination reduction area lies between the outer exclusion area boundary and the contamination control line. In this area, a deliberate attempt is made to control and reduce contamination picked up by personnel returning from the exclusion area. This area, designated

for decontamination operations, is called the personnel decontamination station (PDS). Operations within the PDS are discussed in Section 3.7.

3.2.4 Contamination Control Line

The contamination control line is the rear boundary of the contaminated reduction area and is the line separating the possibly contaminated area from the clean area. Entry from the clean support area to the contamination control area is always made through an access control point on the contamination control line. No person may cross this line unless he or she has the proper level of protection.

3.2.5 Support Area (Administrative)

The support area is always established in a clean area. It contains the command post (CP) and other support elements. The distance from the contamination control line to the CP is approximately 50m, adjustable according to known site conditions. The CP is the center of command and control for the entire operation; it is always upwind of the contamination area and, if possible, on high ground to provide visual observation of the entire area.

3.2.6 Wind Direction

The guiding principle in organizing the field site is a simple one. If at all possible, the CP should be located upwind from the hazard area. If terrain or water will not accommodate this arrangement, a cross wind is acceptable. If the CP must be located downwind from the site, all personnel may have to don appropriate breathing apparatus. Significant variations in normal prevailing winds can be monitored through maintaining on-site weather status reports and making use of local weather reports for daily planning and updating.

3.3 ORGANIZATION FOR WORK

The personnel requirements for conducting operations on a hazardous substances site are dependent on a number of factors. For simplicity, the present discussion focuses on a five-member team (see Figure 8).

3.3.1 Command and Control

Command and control of the work site is exercised from the CP, which is manned by a CP supervisor or team leader. The CP will maintain radio contact with other team personnel and, by radio, will direct their actions. The CP supervisor also maintains contact with the PM and other personnel not on site. In a five-person team, only one team member (usually the team leader) will remain in the CP.

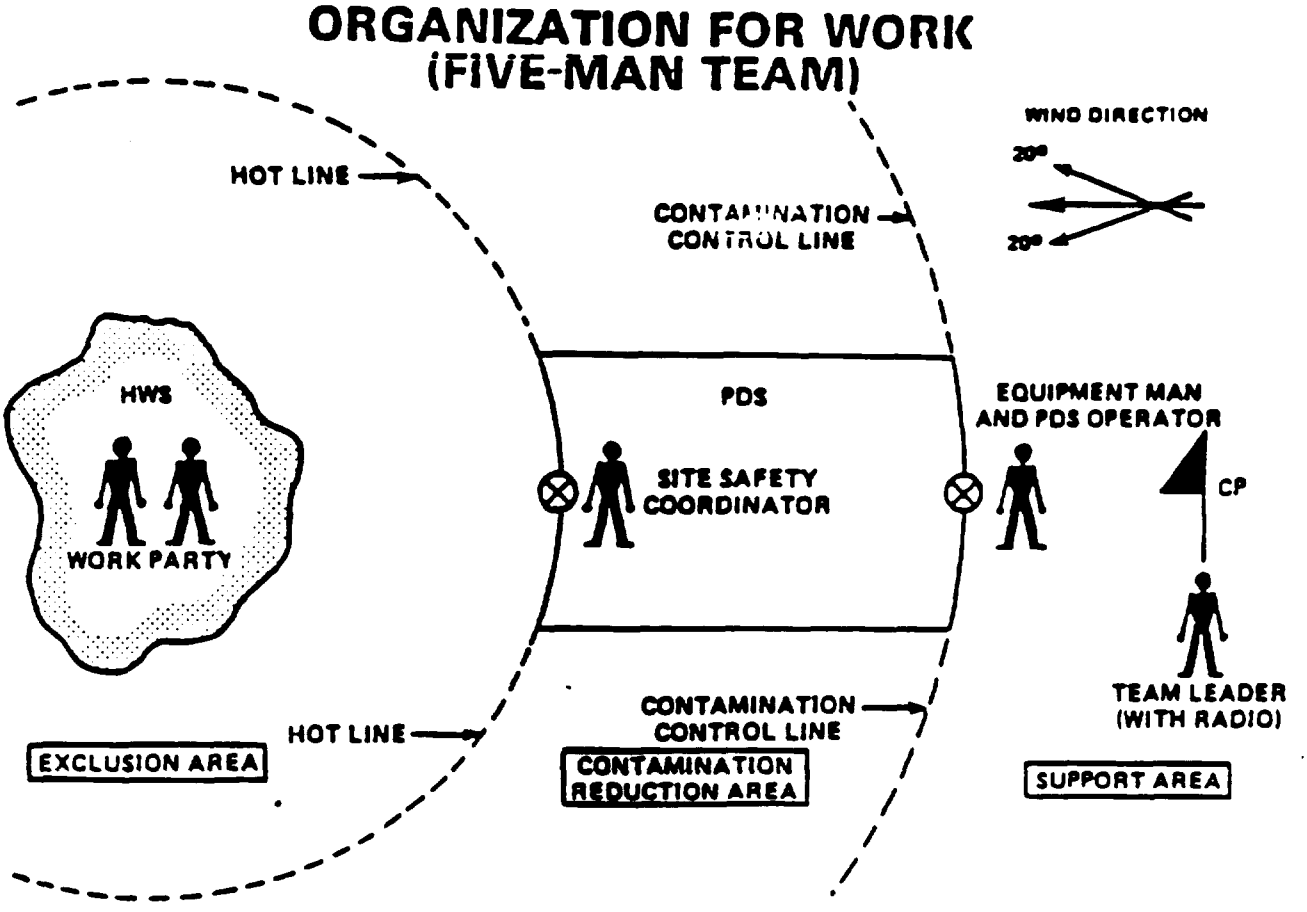

Figure 3-8 ORGANIZATION FOR WORK

3.3.2 PDS Operator

One team member will be designated as the PDS operator. This team member processes work teams into the hazard site and decontaminates personnel returning from the hazard site. He or she also is responsible for equipment checkout and recharging of respirator tanks. In a five-person team, the safety officer must help the PDS operator during in-and-out processing of team members.

3.3.3 Safety Officer

The safety officer is positioned on the hot line, where he or she can observe the actions of work parties down range. Line of site between the safety officer and sampling team should be maintained at all times. The safety officer directs withdraval of the work parties if, in his or her judgment, actions are being performed that may be unsafe. The safety officer is the primary advisor to the team leader on all matters relating to safety.

3.3.4 Work Party (Sampling Team)

The final element of this hypothetical team is the work party. The work conducted by the two-person team provides the reason for being onsite; this team performs the necessary tasks called for in the site investigation. It can be given the folloving designations:

- o The initial entry party - if it is the first team on site. It serves as a reconnaissance team, gathering information about the site.
- o The work party - if performing general work or making general observations.
- o Sampling team - when sample collection is the sole purpose for being on site.

The work party will never consist of less than two individuals, but may be larger if required to accomplish the work directed.

3.4 AIR MONITORING AND CHARACTERIZATION EQUIPMENT

Specialized equipment is used to measure and characterize air contaminants on a hazardous waste site. This information determines the nature and condition of the vastes present, the locations of "hot spots," and the level of worker protection required. This equipment is also used to monitor the site for changes in air contaminant concentrations during investigator work and to screen samples.

Although the instruments are designed for field investigations, they are inherently sensitive to environmental conditions and have

defined limitations and interferences, which may cause elevated or suppressed readings. In some cases, a measurement from one instrument may substantiate measurements from another; but in all cases, the information obtained from all instruments should be used to determine the overall picture of the site.

Monitoring instruments should be operated only by trained and experienced personnel who have a proper understanding of the use, limitations, and implications of these instruments and the wastes present at the site. Considerations for developing air monitoring strategies at hazardous waste sites are shown in Figure 9. The following subsections describe monitoring equipment.

3.4.1 Explosimeter

- **Description and Use:** The explosimeter determines the level of flammable vapors or dusts present in an atmosphere as a percentage of the lower explosive limit (percent LEL) by measuring the change in electrical resistance in a Whetstone bridge circuit.

- **Operation:** (See Appendices B and C.)

- **Limitations:** The explosimeter cannot be used in atmospheres where the oxygen level is below 19.5 percent or above 25 percent. Silicanes, silicones, silicates, and leaded gasoline vapors can destroy the instrument's sensitivity. The explosimeter does not indicate if a given atmosphere is toxic. The instrument must be calibrated daily. It will respond with varying sensitivities to various compounds.

- **Action Levels:**

  - If less than 20 percent LEL, continue site inspection.

  - If between 20 and 50 percent LEL, continue site inspection with continuous and careful monitoring; identify source, if possible.

  - If greater than 50 percent LEL, evacuate site immediately, notify proper emergency agency.

3.4.2 Oxygen Detector

- **Description and Use:** The oxygen detector measures the atmospheric oxygen concentration directly by means of a galvanic cell.

- **Operation:** (See Appendix C.)

SITE CONDITIONS	METEOROLOGICAL FACTORS	INSTRUMENT FACTORS
• Disposal Method (surface impoundment, landfill, drums, landfarm, etc.)	• Wind Speed	• Sensitivity/Limits of Detection
• Topography	• Wind Direction	• Accuracy
• Surface Area Exposed	• Stability Class	• Precision
• Type of Remedial Activity	• Temperature	• Bias
• Level and Frequency of Site Activity	• Humidity	• Specificity/Interferences
• Baseline Pollutant Levels (downwind)	• Solar Loading	• Range
• Ambient Air Quality (upwind)	• Barometric Pressure	• Response Time
• Containment Integrity	• Changing Wind Direction and Speed	• Service Life
• Concentration of Contaminant (current)		• Weight
• Age of Site		• Mobility
• Predicted Emissions From Remedial Activity		• Power Requirements
• Agents (number, class, compatibility)		• Sorbent Media
• Physical/Chemical Properties of Agents		• Versatility
• Vehicular Traffic (location and volume)		• Support Equipment (calibration, recorders, sample injection, tools, etc.)
• On-Site Traffic and Equipment Emissions		• Flow Rate
• Inter-Site Emission Locations		• Sampling Time
		• Weather Resistance
		• Ruggedness/Durability

Figure 3-9 CONSIDERATION FOR AIR TOXICS MONITORING STRATEGIES

3.4.5 HNU Photoionizer

- **Description and Use:** The HNU photoionizer is used to determine the concentration of organic and inorganic vapors and gases with an ionization potential (IP) of less than 11.7 electron volts or 10.2 electron volts, depending on probe in use.

- **Operation:** (See Figure 10.)

- **Limitations:** The HNU photoionizer does not respond to compounds with ionization energies greater than the probe's potential, such as methane (CH_4), or hydrogen cyanide (HCN). The instrument's sensor cannot be immersed, and it functions poorly in cold or moist weather. The response will vary with different compounds.

- **Action Levels:** Calibration to zero on "standby." The following action levels are for "above background" concentrations.

  0 - 1 ppm: Level D protections generally sufficient
  1 - 5 ppm: Don air purifying respirator (APR)
  5 - 500 ppm: Don self contained breathing apparatus (SCBA)

3.4.6 Organic Vapor Analyzer (OVA) in the Survey Mode

- **Description and Use:** The OVA provides a continuous readout of the total concentration of organic vapors and gasses by using a flame ionization detector.

- **Operation:** (See Figure 10.)

- **Limitations:** The OVA needs to be warmed up prior to use, and loses sensitivity in humid or moist conditions. The OVA can be used only by specially trained operators. It does not respond to inorganic vapors (most importantly HCN) but it does respond to methane (CH_4).

- **Action Levels:** The following levels are action for "above background," non-methane concentrations.

  0 - 1 ppm: Level D protection generally sufficient
  1 - 5 ppm: Don APR
  5 - 500 ppm: Don SCBA

3.4.7 OVA in the Gas Chromatographic (GC) Mode

- **Description and Use:** In the GC Mode, the OVA is used to characterize and identify specific organic compounds on site. It can be operated in conjunction with gas-tight syringes, Mylar bags, and air sampling pumps. In this mode it is also used to

PRIMARY FIELD AIR QUALITY SURVEY INSTRUMENTS

I. EQUIPMENT USED TO LOCATE "HOTSPOTS"

- o Photoionization Detector (PID)
  - The photoionizer by HNU is used to determine the concentration of organic and inorganic vapors and gases with a ionization potential (IP) less than 11.7 electron volts (ev).
  - The photoionizer does not respond to methane (CH_4) or hydrogen cyanide (HCN). The instrument's sensor is water soluble and cannot be immersed.
- o Organic Vapor Analyzer (OVA)
  - The OVA provides a continuous readout of the total concentration of organic vapors and gases by the use of a flame ionization detector.
  - The OVA can be used only by specifically trained operators. It does not respond to inorganic vapors (most importantly, HCN), but it does respond to methane.

II. EQUIPMENT USED IN AMBIENT AIR CHARACTERIZATION AND SAMPLE SCREENING

- o OVA in Gas Chromatographic (GC) Mode
  - In the GC mode, the OVA can be used to characterize and identify specific organic compounds on site. It can be operated in conjunction with gas-tight syringes, Mylar bags, and sampling pumps. In this mode, it is also used to screen samples before submitting them to the laboratory for analysis.
  - In the GC mode, additional specialized training is needed by the operator, and field standards have to be produced.

Figure 3-10 PRIMARY FIELD AIR QUALITY SURVEY INSTRUMENTS

screen samples prior to submitting them to the laboratory for analysis.

- o Operation: (See Figure 10.)
- o Limitations: The OVA can be used only by personnel trained in gas chromatography.

3.4.8 Other Equipment

Other equipment which may be used to further evaluate personal protection requirements include:

- o Air particle counter (Dust meter),
- o pH meter,
- o H_2S monitor (Hydrogen sulfide), and
- o HCN monitor (Hydrogen Cyanide).

3.4.9 Initial Site Entry Action Levels

These action levels are specifically established in the SSP. Each E & E employee is responsible for knowing the initial site entry action levels and the appropriate actions to be taken while on a hazardous substance site. See Figure 11 for a summary of the action levels.

3.4.10 Action Level for Radiation

When there is a reading indicating the presence of any radiation above the background level, E & E employees are to leave the site and report their findings to the RSC. Figure 12 provides the Federal Standard for Radiation Workers. These standards are NOT to be exceeded at any time.

3.4.11 Instrument Training

Each E & E employee must be familiar with the equipment used for site characterization. The following training aids are attached:

- o Appendix B: MSA Model 2A Explosimeter
- o Appendix C: MSA Combustable Gas and Oxygen Alarm (Model 260)
- o Appendix D: Draeger Tube Samplers
- o Appendix E: Radiation Alert-Mini

3.5 INITIAL ENTRY

An initial entry is conducted to confirm whether the historical background review is correct or whether the site conditions have changed the extent of the hazards. If limited or no information is available, the entry team will determine conditions and hazards.

INITIAL SITE ENTRY ACTION LEVELS

- o EXPLOSIMETER
  - less than 20% LEL: Continue site inspection
  - between 20% and 50% LEL: Continue site inspection, Continuous/careful monitoring to identify the source, if possible
  - above 50% LEL: EVACUATE IMMEDIATELY; Notify proper emergency agency
- o OXYGEN METER
  - less then 19.5%: Continue inspection with SCBA; Monitoring continuously; Explosimeter readings not valid below 19.5% or above 25% oxygen
- o DRAEGER TUBES
  - Species dependent: Consult "Dangerous Properties of Industrial Materials," Sax
- o RADIATION SURVEY METER
  - Above background reading: EVACUATE IMMEDIATELY; Notify proper agency

Figure 3-11 INITIAL SITE ENTRY ACTION LEVELS .S

FEDERAL STANDARDS FOR RADIATION WORKERS

WHOLE BODY PERMISSIBLE EXPOSURE	TIME
1.25 rem	Per quarter
5.00 rem	Per year
5(N-18) N= age of person	Lifetime

Figure 3-12 FEDERAL STANDARDS FOR RADIATION WORKERS

The team is linked to the command post by radio communications and will carry all air and radiological monitoring equipment needed to characterize the hazards on site. The members should be constantly alert and watchful for unstable soil, unstable structures or containers, buried or partially buried drums or debris, waste pools or piles, enclosed spaces, protruding objects, or any other dangerous or hazardous conditions. Avoidance of travel over or through waste should be practiced. In no case (unless specified in the work plan and health and safety plan), shall any team member climb onto, or cross-over drums, tanks, waste containers, or confined spaces.

Detailed observations are to be recorded in the field logbook including observed hazards, identified container labels, container condition, instrument readings, and apparent spill or waste areas. A Polaroid camera is useful in documenting site conditions which can be displayed at the command post.

It is crucial that the monitoring instruments be watched closely. The team should proceed slowly and cautiously, as the instruments will indicate hazardous environments before the team members would inadvertently enter one. The team should also keep in mind the evacuation route from the site should an emergency occur.

A checklist for entry into a hazardous waste site is presented in Figure 13.

3.6 EGRESS

Egress from the hazardous site must be carried out as a planned action---not as a panic reaction to low air reserves or other expected or exceptional circumstance. For example, it is not correct egress procedure to wait for the warning bell to ring on the SCBA oxygen tank, before attempting to reach the hot line in time for fresh air supplies. Not only must egress be planned before to entry, but it must also be understood that no team member may egress alone, and that no team member may remain on-site alone. Operations are always carried out according to the buddy system. Figure 14 summarizes some factors to be considered while planning an egress from the hazardous area.

3.7 PDS PROCEDURES (DECONTAMINATION)

The procedures discussed in this section are established to ensure that contamination is not spread to equipment, other team members, unprotected personnel, or the surrounding countryside.

3.7.1 Location of the PDS

The PDS lies in the area referred to as the contamination reduction area and is designed to help ensure that all personnel returning from

CHECKLIST FOR ENTRY INTO HAZARDOUS SITE

- o ACTIONS IN SUPPORT AREA
  - WORK PARTY BRIEFING
  - EQUIPMENT CHECK
  - DONNING OF PROTECTIVE CLOTHING
  - CHECKOUT PROTECTIVE ENSEMBLE
  - COMMUNICATION CHECK
- o ACTIONS IN CONTAMINATION REDUCTION ARIA
  - FINAL COMMUNICATION EQUIPMENT CHECK
  - ENTER EXCLUSION ZONE VIA ACCESS CONTROL POINT
- o ENTRY TO SITE
  - SLOW AND DELIBERATE
  - FOLLOW PREARRANGED ROUTE
  - MAINTAIN BUDDY SYSTEM
  - MAINTAIN CONTACT WITH SAFETY OFFICER
  - MONITOR WIND DIRECTION
  - CONDUCT AMBIENT AIR MONITORING

Figure 3-13 CHECK LIST FOR ENTRY INTO A HAZARDOUS WASTE SITE

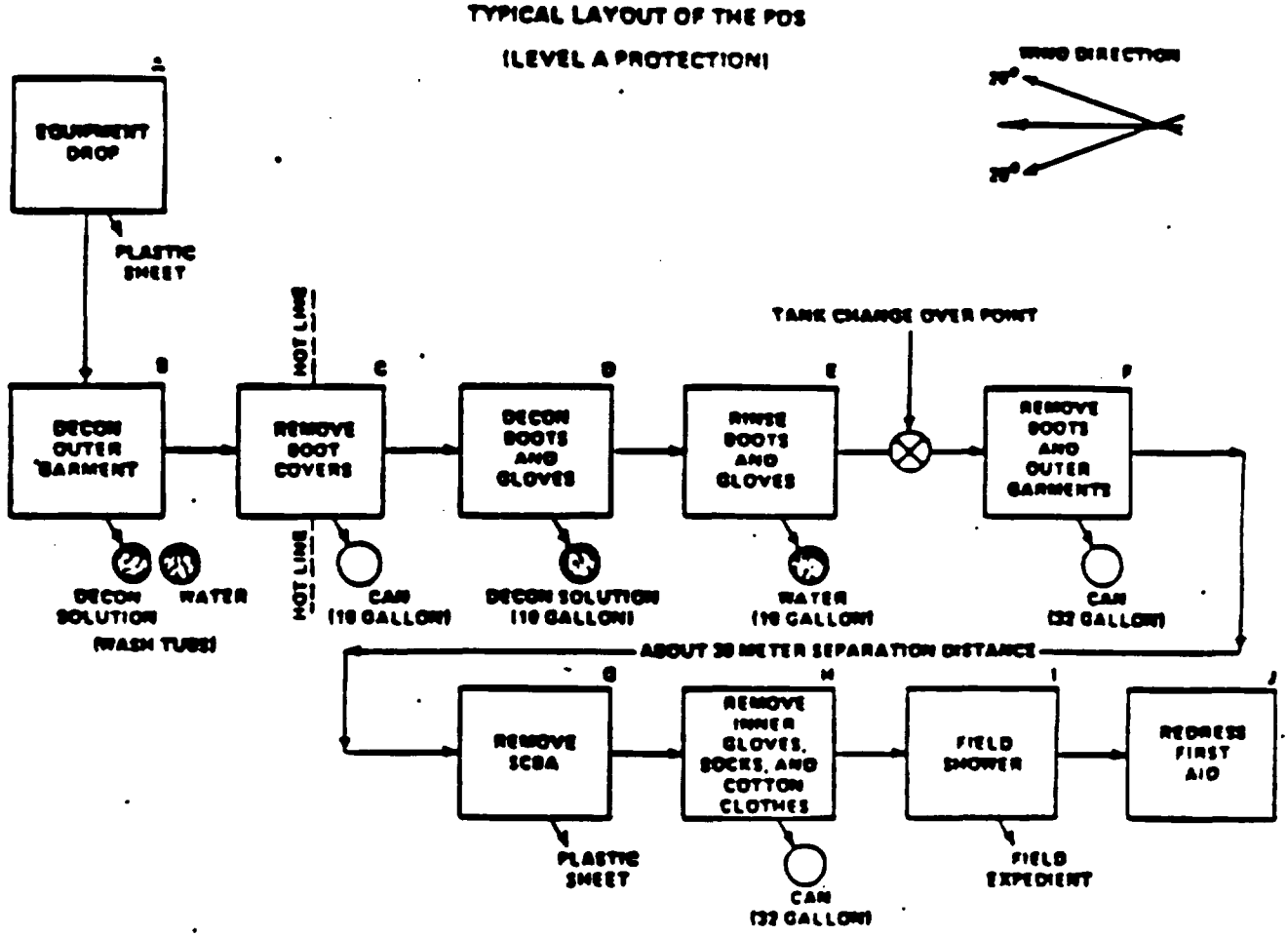

Figure 3-14 EGRESS FROM THE HAZAROUS WASTE SITE

the site have been completely decontaminated before re-entry into the clean support area. (See Figure 7.)

3.7.2 Level A PDS Organization

Figure 15 is a graphic representation of a typical Level A PDS. It is designed with safety in mind and has been in use by U.S. Army units as a means of controlling chemical or biological contamination from heavily contaminated areas. Although these procedures may appear to represent an "overkill," they are time tested and proven to be effective. Until experience proves other procedures to be better, these will remain the procedures adopted by E & E.

3.7.3 Level A PDS Step-by-Step Procedures

- Step 1 - **Equipment Drop.** A plastic groundcloth is adequate for the equipment drop.
- Step 2 - **Outer Garment Decontamination.** Accomplished by PDS operators using sponges, brushes, and fire cans. Ten percent solutions of NaOH, Na2CO3, or Ca(OCI)2 serve as good decontaminants.
- Step 3 - **Remove Boot Covers.** PDS operators will remove booties and place them in a 10-gallon can lined with plastic.
- Step 4 - **Decontaminate Boots and Gloves.** Accomplished by team members who step in washtub of decontaminant for boots and dip gloves in bucket of decontaminant. Use decontaminant as in Step 2.
- Step 5 - **Rinse Boots and Gloves.** Same procedures as Step 4, except that water is used for the rinse.
- Step 6 - **Remove Boots and Outer Garments.** Accomplished with help from PDS operator. Place boots and suits in a 32-gallon can.
- Step 7 - **Remove SCBA.** Accomplished with help of PDS operator. Place SCBA on plastic sheet.
- Step 8 - **Remove Inner Gloves, Socks, and Cotton Clothes.** Accomplished with help of PDS operator. Place cotton items in second 32-gallon can lined with plastic bag.
- Step 9 - **Field Shower.** Any type of field expedient facility allowing for a minimum of a full rinse.

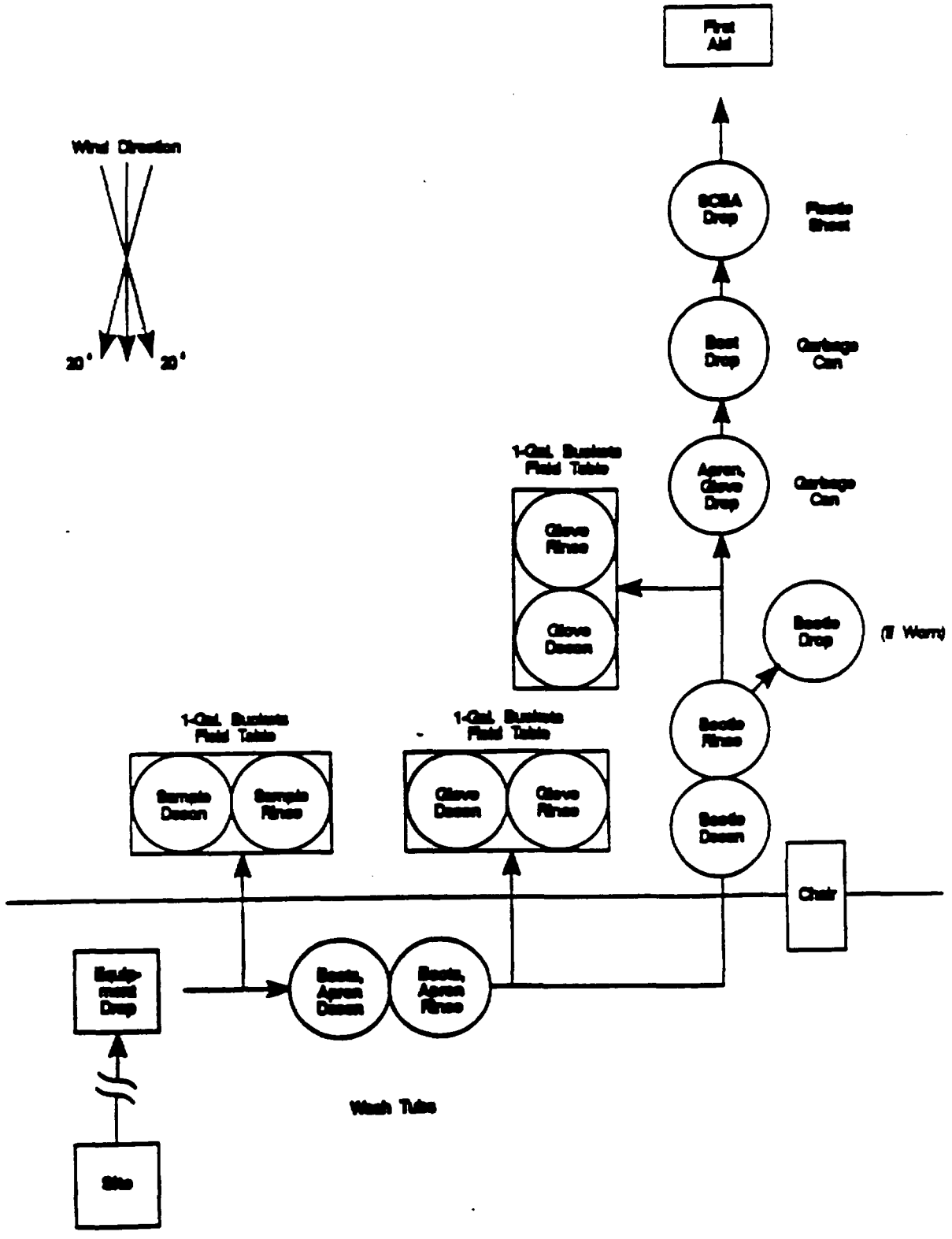

Figure 16. LEVEL B PDS

Decon Solution	Mixing Solutions	Uses/Remarks
A. An aqueous solution containing a low-sudsing detergent.	Follow the mixing instructions written on the particular product label.	Generally has the widest range of use. Best choice on sites where contaminant is unknown or a wide range of contaminants exists.
B. An aqueous solution containing 3% sodium carbonate (Na_2CO_3) washing soda.	To ten gallons of water, add four pounds of sodium carbonate.	Decon solution of choice for base labile compounds such as the organophosphate pesticides. Effective in neutralizing inorganic acids. Since sodium carbonate is a water softening agent, this characteristic is an aid in physical removal of contaminants.
C. An aqueous solution containing 3% sodium bicarbonate ($NaHCO_3$) baking soda.	To ten gallons of water, add four pounds of sodium bicarbonate.	Sodium bicarbonate is amphoteric and can be used to neutralize either base or acid contaminants. Good decon for base labile compounds.
D. An aqueous solution containing 3% trisodium phosphate (Na_3PO_4) TSP.	To ten gallons of water, add approx. 2 pounds of trisodium phosphate.	See uses/remarks for Decon Solution B above
E. An aqueous solution containing 10% calcium hypochlorite ($Ca(ClO)_2$) HTH.	To ten gallons of water, add 8 pounds of calcium hypochlorite	Cyanide salts
F. Ethylenediaminetetraacetic acid (EDTA, versene, sequestrene)	Commercial product, follow product label.	EDTA is a chelating agent and is decon of choice for heavy metal contaminants.
G. An aqueous solution containing 3 to 3% citric, tartaric, malic acids or their respective sodium salts.	To ten gallons of water, add four pounds citric, tartaric or malic acid.	These compounds are chelating agents and are a decon of choice for heavy metal contaminants.

Figure 3-17 DECONTAMINATION SOLUTIONS